

## Course Description for Computed Tomography Equipment Techniques

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|---------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Course Name:                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Computed Tomography Equipment Techniques                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 2. Course Code:                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| MTRA2104                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 3. Semester / Year:                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Annual System                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 4. Description Preparation Date:                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 2026-2025                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 5. Available Attendance Forms:                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Daily attendance                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 6. Number of Credit Hours (Total) / Number of Units (Total)         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 105hrs./ units4                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 7. Course administrator's name (mention all, if more than one name) |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Name: Dr. Hussein Abed Dakhil<br>Email: hussaien.abed@gmail.com     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 8. Course Objectives                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Course Objectives</b>                                            | <ol style="list-style-type: none"> <li><b>Understanding the basic principles of CT imaging:</b> Introducing students to how CT scanners work and the process of creating images using X-ray techniques.</li> <li><b>Introducing students to CT applications in medicine:</b> Explaining how CT imaging is used in diagnosing diseases and guiding treatment, including neurological diseases, tumors, and respiratory diseases.</li> <li><b>Specifications and techniques of CT imaging:</b> Introducing students to the latest advancements in CT imaging techniques, such as multi-slice imaging and advanced scanning technologies.</li> <li><b>Handling CT equipment:</b> Teaching students how to operate CT scanners and imaging equipment, along with safety procedures related to radiation exposure.</li> <li><b>Understanding and interpreting generated images:</b> Training students on how to interpret CT images and use them in medical diagnosis.</li> </ol> |
| 9. Teaching and Learning Strategies                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Strategy</b>                                                     | <ul style="list-style-type: none"> <li>The scientific material is determined according to the prescribed curriculum, with a comprehensive lecture booklet provided, containing the most important required topics and illustrative diagrams to support understanding.</li> <li>The course material is presented using well-prepared PowerPoint presentations, ensuring an interactive teaching approach that engages students in the learning process through questions and group discussions.</li> <li>After the lecture, students are provided with a recorded video that includes a full explanation of the material, enabling them to review the content at any time. To ensure comprehension of the subject matter, understanding is assessed through daily short quizzes</li> </ul>                                                                                                                                                                                    |

or weekly assignments that require students to apply the discussed concepts.

**Additional Notes:**

- Interaction can be enhanced using modern educational tools such as interactive online quizzes.
- Encouraging active participation by awarding extra points for contributions during the lecture.
- Allocating a short time in each lecture to address students' questions to ensure clarity on all points.

## 10. Course Structure

| Week | Hours | Required Learning Outcomes               | Unit or subject name            | Learning method     | Evaluation method      |
|------|-------|------------------------------------------|---------------------------------|---------------------|------------------------|
| 1st  | 7     | Understanding the history of CT scanners | History of Computed Tomography  | Lecture + Practical | Quizzes and Oral Exams |
| 2nd  | 7     | Basic principles of CT scanners          | Basic Principles of CT Scanners | Lecture + Practical | Quizzes and Oral Exams |
| 3rd  | 7     | Understanding helical movement           | Helical/Spiral CT Scanners      | Lecture + Practical | Quizzes and Oral Exams |
| 4th  | 7     | Understanding interpolation algorithms   | Interpolation Algorithms        | Lecture + Practical | Quizzes and Oral Exams |
| 5th  | 7     | Multislice CT scanners                   | Multidetector-row CT (MSCT)     | Lecture + Practical | Quizzes and Oral Exams |
| 6th  | 7     | CT system design                         | CT System Design (SSCT & MSCT)  | Lecture + Practical | Quizzes and Oral Exams |
| 7th  | 7     | Collimation                              | Collimation                     | Lecture + Practical | Quizzes and Oral Exams |
| 8th  | 7     | Control Console                          | Control Console                 | Lecture + Practical | Quizzes and Oral Exams |
| 9th  | 7     | Reconstruction methods                   | Reconstruction Methods          | Lecture + Practical | Quizzes and Oral Exams |
| 10th | 7     | Iterative reconstruction                 | Iterative Reconstruction        | Lecture + Practical | Quizzes and Oral Exams |
| 11th | 7     | CT image quality                         | CT Image Quality                | Lecture + Practical | Quizzes and Oral Exams |
| 12th | 7     | Image noise                              | Image Noise                     | Lecture + Practical | Quizzes and Oral Exams |
| 13th | 7     | Image artifacts                          | Image Artifacts                 | Lecture + Practical | Quizzes and Oral Exams |
| 14th | 7     | Positron Emission Tomography             | PET/CT                          | Lecture + Practical | Quizzes and Oral Exams |
| 15th | 7     | Advanced technical CT applications       | Advanced CT Applications        | Lecture + Practical | Quizzes and Oral Exams |

## 11. Course Evaluation

The students will be assessed through a midterm exam (40 marks) + a final exam (60 marks), with a total of 100 marks.

| 12. Learning and Teaching Resources                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-----------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Required textbooks<br>(curricular books, if any)                      | <ol style="list-style-type: none"> <li>1. Stewart Carlyle Bushong, “<b>Radiologic Science for Technologists: Physics, Biology, and Protection</b>”, Elsevier, Inc., 7th edition, 2001.</li> <li>2. Chris Guy &amp; Dominic ffytche, “<b>An Introduction to The Principles of Medical Imaging</b>”, Imperial College Press, 2005.</li> <li>3. Perry Sprawls, “<b>Physical Principles of Medical Imaging</b>”, 2nd Edition, 1996.</li> <li>4. J. Hsieh, “<b>Computed Tomography: Principles, Design, Artifacts, and Recent Advances</b>”, 2nd edition, Wiley Interscience, 2009.</li> <li>5. Euclid Seeram, “<b>Computed Tomography: Physical Principles, Clinical Applications, and Quality</b>”</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Main references<br>(sources)                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Recommended books and references<br>(scientific journals, reports...) | <ol style="list-style-type: none"> <li>1. William R. Hendee &amp; E. Russell Ritenour, “<b>Medical Imaging Physics</b>”, 4th Edition, Wiley-Liss, 2002.</li> <li>2. Khan, Faiz M., “<b>The Physics of Radiation Therapy</b>”, 5th Edition, Lippincott Williams &amp; Wilkins, 2014.</li> <li>3. Albert Macovski, “<b>Medical Imaging Systems</b>”, Prentice-Hall, 1983.</li> <li>4. Geoffrey Hounsfield, “<b>Computed Tomography and Ultrasound</b>”, Academic Press, 1980.</li> <li>5. Jerrold T. Bushberg et al., “<b>The Essential Physics of Medical Imaging</b>”, 3rd Edition, Lippincott Williams &amp; Wilkins, 2011.</li> <li>6. Ehsan Samei &amp; Donald J. Peck, “<b>Hendee's Physics of Medical Imaging</b>”, 5th Edition, Wiley-Blackwell, 2020.</li> <li>7. Bernhard Schmitt et al., “<b>Magnetic Resonance Imaging: An Introduction to the Physics</b>”,</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Electronic References, Websites                                       | <ol style="list-style-type: none"> <li>1. <b>Radiopaedia</b>: A free educational website that contains articles and clinical images in the field of medical imaging.<br/>Link: <a href="http://www.radiopaedia.org">www.radiopaedia.org</a></li> <li>2. <b>American College of Radiology (ACR)</b>: Contains guidelines and references related to medical imaging and clinical practices.<br/>Link: <a href="http://www.acr.org">www.acr.org</a></li> <li>3. <b>RSNA (Radiological Society of North America)</b>: Provides educational resources, research, and recent articles on medical imaging. Link: <a href="http://www.rsna.org">www.rsna.org</a></li> <li>4. <b>National Institutes of Health (NIH) - Imaging</b>: A scientific platform containing research and reports on the applications of medical imaging.<br/>Link: <a href="http://www.nih.gov">www.nih.gov</a></li> <li>5. <b>Physics Open Resources by IAEA</b>: Educational resources on medical physics and imaging technologies provided by the International Atomic Energy Agency. Link: <a href="http://www.iaea.org">www.iaea.org</a></li> <li>6. <b>PubMed</b>: A scientific database that contains research papers and articles in the field of medical imaging.<br/>Link: <a href="http://pubmed.ncbi.nlm.nih.gov">pubmed.ncbi.nlm.nih.gov</a></li> <li>7. <b>Computed Tomography (CT) Basics</b>: A platform that focuses on</li> </ol> |

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|  | <p>explaining the principles of computed tomography in a simplified manner. Link: <a href="http://www.ctisus.com">www.ctisus.com</a></p> |
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|  | <p>8. <b>European Society of Radiology (ESR)</b>: Offers articles and training courses related to advancements in medical imaging.<br/>Link: <a href="http://www.myesr.org">www.myesr.org</a></p> |
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## Course Description for Special radiological procedures of gastrointestinal tract and bones

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|---------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Course Name:                                                     | Special radiological procedures of gastrointestinal tract and bones                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 2. Course Code:                                                     | MTRA2103                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 3. Semester / Year:                                                 | Annual System                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 4. Description Preparation Date:                                    | 2026–2025                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 5. Available Attendance Forms:                                      | Daily attendance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 6. Number of Credit Hours (Total) / Number of Units (Total)         | 105hrs./ units4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 7. Course administrator's name (mention all, if more than one name) | Name: Dr. Ahmed MohamedBaqer Easa<br>Email: <a href="mailto:ahmedeasa1985@gmail.com">ahmedeasa1985@gmail.com</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 8. Course Objectives                                                | <b>Course Objectives for Program</b><br><br><ol style="list-style-type: none"><li><b>Enhance theoretical knowledge and practical skills:</b> Learn various radiographic examination techniques, including X-ray, MRI, and CT, with hands-on training on advanced medical equipment.</li><li><b>Promote safety and quality standards:</b> Understand radiation safety measures and protocols to ensure a safe environment for patients and healthcare teams.</li><li><b>Medical image analysis and decision-making:</b> Enable students to accurately interpret and analyze medical images while developing critical thinking skills for sound diagnostic decisions.</li><li><b>Professional readiness and effective communication:</b> Prepare students to work efficiently in multidisciplinary medical environments and improve communication skills with healthcare teams and patients.</li><li><b>Keep up with technological advancements:</b> Stay updated on the latest innovations and technologies in radiographic examinations to ensure best practices are applied.</li></ol> |
| 9. Teaching and Learning Strategies                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

**Teaching and Learning Strategies for Program:**

1. **Theoretical lectures:** Explain fundamental concepts using interactive teaching tools.
2. **Practical training:** Apply imaging techniques in laboratories and hospitals.
3. **Case-based learning:** Analyze and study real clinical cases to develop decision-making skills.
4. **Simulation:** Use simulation software to train students on procedures before working with patients.
5. **Group discussions:** Discuss scientific topics and clinical cases in group settings.
6. **Projects and research:** Prepare research papers and projects related to medical imaging techniques.
7. **Blended learning:** Combine traditional and online education using educational platforms.
8. **Clinical training:** Apply knowledge practically in hospitals under the supervision of specialists.
9. **Self-directed learning:** Encourage exploration of scientific references and participation in workshops.

**10. Course Structure**

| Week | H | Unit or subject name                                                                             | Required Learning Outcomes                                                                                                                                                                          | Learning method                   | Evaluation method                     |
|------|---|--------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------------------|
| 1    | 7 | Intravascular Contrast Media                                                                     | Introduce students to intravascular contrast media, their properties, and mechanism of action. Analyze the adverse effects of water-soluble contrast media on vital organs and preventive measures. | Lecture + Practical demonstration | Short test + Oral questions           |
| 2    | 7 | Adverse Effects of Intravenous Water-Soluble Contrast Media on Specific Organs                   | Understand the contrast agents used in MRI and study their composition and the mechanism of gadolinium action.                                                                                      | Practical lab training            | Practical assessment + Report         |
| 3    | 7 | Contrast Agents in Magnetic Resonance Imaging                                                    | Explain the use of barium and water-soluble contrast agents in imaging the gastrointestinal tract.                                                                                                  | Lecture + Practical training      | Practical test + Case study           |
| 4    | 7 | Methods of Imaging of Gastrointestinal Tract (GIT) with Barium and Water-Soluble Contrast Agents | Train students on barium swallow and meal examinations for diagnosing upper GIT disorders. Enable students to perform barium follow-through and small bowel enema imaging.                          | Lecture + Practical session       | Oral test + Practical assessment      |
| 5    | 7 | Barium Examination: Swallow and Meal                                                             | Familiarize students with barium enema techniques, including barium enema, instant enema, and air enema procedures.                                                                                 | Lecture + Educational video       | Test questions + Practical assessment |

|    |   |                                                            |                                                                                                           |                                   |                                  |
|----|---|------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|-----------------------------------|----------------------------------|
| 6  | 7 | Barium Examination: Follow Through, Small Bowel Enema      | Explain the role of imaging using barium or air enema in reducing intestinal intussusception in children. | Lecture + Practical session       | Report + Oral questions          |
| 7  | 7 | Barium Examination: Barium Enema, Instant Enema, Air Enema | Train students to use CT imaging for diagnosing GIT disorders.                                            | Lecture + Practical session       | Practical assessment + Report    |
| 8  | 7 | Reduction of Intussusception                               | Introduce students to MRI techniques for evaluating and diagnosing GIT disorders.                         | Lecture + Practical session       | Practical test + Case analysis   |
| 9  | 7 | Computed Tomography of the Gastrointestinal Tract          | Provide an overview of different imaging techniques for diagnosing bone and joint diseases.               | Lecture + Practical session       | Practical test + Report          |
| 10 | 7 | Magnetic Resonance Imaging of the Gastrointestinal Tract   | Study the general principles of musculoskeletal MRI.                                                      | Lecture + Practical session       | Oral test + Practical assessment |
| 11 | 7 | Imaging Modalities of Bones & Joints                       | Learn the basics of arthrography and its clinical indications.                                            | Lecture + Practical session       | Oral questions + Practical test  |
| 12 | 7 | Musculoskeletal MRI - General Points                       | Train students on arthrographic imaging techniques for the knee and hip joints.                           | Lecture + Educational video       | Report + Practical assessment    |
| 13 | 7 | Arthrography - General Points                              | Enable students to perform arthrographic imaging of the shoulder and elbow joints.                        | Lecture + Practical demonstration | Theoretical test + Case analysis |
| 14 | 7 | Arthrography of the Knee & Hip                             | Explain arthrographic imaging techniques for the wrist and ankle joints using contrast media.             | Lecture + Practical session       | Practical test + Report          |
| 15 | 7 | Arthrography of the Shoulder & Elbow                       | Introduce students to radionuclide bone scanning for diagnosing bone and joint diseases.                  | Lecture + Practical session       | Practical test + Report          |

## 11. Course Evaluation

The students will be assessed through a midterm exam (40 marks) + a final exam (60 marks), with a total of 100 marks.

## 12. Learning and Teaching Resources

|                                                  |                                                                                                                                                                                                                                                                                                                                                            |
|--------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Required textbooks<br>(curricular books, if any) | Watson, N. & Jones, H. chapman & Nakielnys "Guide to Radiological procedures", 7th edition, Elsevier Health Sciences, 2017.                                                                                                                                                                                                                                |
| Main references (sources)                        | <ol style="list-style-type: none"> <li>1. <b>Textbook of Radiology and Imaging</b> by David Sutton</li> <li>2. <b>Fundamentals of Diagnostic Radiology</b> by William E. Brant and Clyde A. Helms</li> <li>3. <b>Radiology: Diagnostic Imaging</b> by Peter Armstrong</li> <li>4. <b>Clinical Radiology: The Essentials</b> by Adam W. Mitchell</li> </ol> |

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|--------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                    | 5. <b>MRI in Practice</b> by Catherine Westbrook and John Talbot<br>6. <b>Computed Tomography: Principles, Design, Artifacts, and Recent Advances</b> by Jiang Hsieh<br>7. <b>Ultrasonography in Obstetrics and Gynecology</b> by Peter W. Callen<br>8. <b>Radiology for the Small Animal Practitioner</b> by Jodi A. Westropp<br>9. <b>PACS: A Guide to the Digital Revolution</b> by H. K. Chung<br>10. <b>Manual of Clinical Oncology</b> by John L. Marshall                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Recommended books and references (scientific journals, reports...) | <b>Supporting Books and References:</b> <ol style="list-style-type: none"> <li>1. Radiology Review Manual by Wolfgang Dähnert</li> <li>2. Atlas of Radiographic Anatomy by Lorrie L. Kelley</li> <li>3. Radiology for Medical Graduates by R. D. O'Neill</li> <li>4. Diagnostic Radiology: Physics and Technology by Philip J. P. Berman</li> <li>5. Introduction to Radiologic Technology by William J. Callaway</li> <li>6. The Radiology of Skeletal Trauma by Thomas L. Pope Jr. and Michael D. O'Malley</li> <li>7. Emergency Radiology: Case Reviews by David R. Collins and Joseph S. Galati</li> <li>8. Diagnostic Imaging for the Emergency Physician by R. Patrick Yochum and Lorrie L. Kelley</li> </ol> <b>Scientific Journals:</b> <ol style="list-style-type: none"> <li>1. Radiology</li> <li>2. American Journal of Roentgenology (AJR)</li> <li>3. European Radiology</li> <li>4. Journal of Computer Assisted Tomography</li> <li>5. Magnetic Resonance Imaging</li> <li>6. Ultrasound in Medicine &amp; Biology</li> <li>7. Journal of Nuclear Medicine</li> </ol> <b>Reports:</b> <ol style="list-style-type: none"> <li>1. Radiology Information System (RIS) Reports</li> <li>2. Clinical Practice Guidelines for Imaging</li> <li>3. American College of Radiology (ACR) <i>Appropriateness Criteria</i></li> </ol> |
| Electronic References, Websites                                    | <ol style="list-style-type: none"> <li>1. <b>PubMed</b> (<a href="https://pubmed.ncbi.nlm.nih.gov">https://pubmed.ncbi.nlm.nih.gov</a>)</li> <li>2. <b>Radiopaedia</b> (<a href="https://radiopaedia.org">https://radiopaedia.org</a>)</li> <li>3. <b>Radiology Masterclass</b> (<a href="https://www.radiologymasterclass.co.uk">https://www.radiologymasterclass.co.uk</a>)</li> </ol> <b>American College of Radiology (ACR)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

## Course Description for Fundamentals of radiation protection

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|------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Course Name:                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Fundamentals of radiation protection                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 2. Course Code:                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| MTRA2106                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 3. Semester / Year:                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Annual System                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 4. Description Preparation Date:                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 25-9-2025                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 5. Available Attendance Forms:                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Daily attendance                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 6. Number of Credit Hours (Total) / Number of Units (Total)                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 75hrs./ units3                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 7. Course administrator's name (mention all, if more than one name)          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Name: Dr. Emad Omar Abdel-Muttalib Mohammed<br>Email: emaddomarr78@gmail.com |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 8. Course Objectives                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Course Objectives</b>                                                     | <ul style="list-style-type: none"> <li>Explain the basic concepts of ionizing radiation.</li> <li>Define the radiation measurement units &amp; international SI units.</li> <li>List the principles of radiological protection (ALARA concept).</li> <li>Explain the meaning of the concept of dose limits, and name the recommended dose limits for radiation workers and the public.</li> <li>Discuss the dose management for pregnancy &amp; obese peoples.</li> <li>Describe the types of radiation detectors and measurement.</li> <li>Explain how to estimate the radiation dose in CT &amp; fluoroscopy.</li> </ul> |
| 9. Teaching and Learning Strategies                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Strategy</b>                                                              | <ul style="list-style-type: none"> <li>Asking questions and guiding students to discover the answers themselves.</li> <li>Using animations and videos to explain scientific concepts.</li> <li>Using discussions and interactive activities to increase engagement and understanding.</li> <li>Assessing students' progress through continuous evaluations like short questions.</li> <li>Allowing students to train in a real-world environment to acquire practical skills.</li> </ul>                                                                                                                                   |

## 10. Course Structure

| Week | Hours | Required Learning Outcomes                                            | Unit or subject name                                                                                                                                                                                 | Learning method                                              | Evaluation method                                                           |
|------|-------|-----------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|-----------------------------------------------------------------------------|
| 1    | 5     | Studying the classification of ionizing radiation and its sources.    | <ul style="list-style-type: none"> <li>• Classification of ionizing radiation.</li> <li>• Sources of ionizing radiation (background radiation).</li> <li>• Comparison of radiation doses.</li> </ul> | Delivering lectures using information technology (computer). | Conducting practical and theoretical exams (midterm + final semester exam). |
| 2    | 5     | Studying the measurement units & international SI units of radiation. | Radiation measurement units & international SI units.                                                                                                                                                | Delivering lectures using information technology (computer). | Conducting practical and theoretical exams (midterm + final semester exam). |
| 3    | 5     | Studying the three main principles of radiological protection.        | The principles of radiological protection.                                                                                                                                                           | Delivering lectures using information technology (computer). | Conducting practical and theoretical exams (midterm + final semester exam). |
| 4    | 5     | Explaining the dose limits for occupational, public, and patients.    | Dose limits.                                                                                                                                                                                         | Delivering lectures using information technology (computer). | Conducting practical and theoretical exams (midterm + final semester exam). |
| 5    | 5     | Understanding the classification                                      | <ul style="list-style-type: none"> <li>• Radiation protection for</li> </ul>                                                                                                                         | Delivering lectures                                          | Conducting practical and                                                    |

|   |    |                                                                                                                        |                                                                                                                                                                                                                                                                |                                                              |                                                                             |
|---|----|------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|-----------------------------------------------------------------------------|
|   |    | of exposure and explaining the meaning of whole-body non-occupational Exposure and partial-body occupational exposure. | classification of exposure. <ul style="list-style-type: none"> <li>• Whole-body non-occupational exposure.</li> <li>• Partial-body occupational exposure.</li> </ul>                                                                                           | using information technology (computer).                     | theoretical exams (midterm + final semester exam).                          |
| 6 | 10 | Studying the occupational radiation exposure in several diagnostic techniques and surgery.                             | <ul style="list-style-type: none"> <li>• Occupational radiation exposure in:               <ul style="list-style-type: none"> <li>- Fluoroscopy.</li> <li>- Mammography.</li> <li>- Computed</li> <li>- Tomography.</li> <li>- Surgery.</li> </ul> </li> </ul> | Delivering lectures using information technology (computer). | Conducting practical and theoretical exams (midterm + final semester exam). |
| 7 | 2  | Explaining the concepts of entrance skin exposure (ESE) and mean marrow dose (MMD).                                    | Patient radiation dose descriptions.                                                                                                                                                                                                                           | Delivering lectures using information technology (computer). | Conducting practical and theoretical exams (midterm + final semester exam). |
| 8 | 2  | Studying the dose and management principles in special cases such as pregnancy and obesity.                            | Dose and management principles in special cases.                                                                                                                                                                                                               | Delivering lectures using information technology (computer). | Conducting practical and theoretical exams (midterm + final semester exam). |
| 9 | 2  | Understanding how the protective barriers in x-ray installations designed.                                             | Design of protective barriers in x-ray installations.                                                                                                                                                                                                          | Delivering lectures using information technology (computer). | Conducting practical and theoretical exams (midterm + final semester        |

|    |   |                                                                                                                                           |                                                                                                                                                     |                                                              |                                                                             |
|----|---|-------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|-----------------------------------------------------------------------------|
|    |   |                                                                                                                                           |                                                                                                                                                     |                                                              | exam).                                                                      |
| 10 | 2 | Knowing and studying the factors that affect the protective barrier thickness.                                                            | Factors that affect barrier thickness.                                                                                                              | Delivering lectures using information technology (computer). | Conducting practical and theoretical exams (midterm + final semester exam). |
| 11 | 2 | Studying several types of devices that used for radiation detection.                                                                      | Radiation detection and measurement.                                                                                                                | Delivering lectures using information technology (computer). | Conducting practical and theoretical exams (midterm + final semester exam). |
| 12 | 2 | Explaining the scintillation detectors and semiconductor detectors that used for radiation detection and studying instrument calibration. | <ul style="list-style-type: none"> <li>• Scintillation detectors.</li> <li>• Semiconductor detectors.</li> <li>• Instrument calibration.</li> </ul> | Delivering lectures using information technology (computer). | Conducting practical and theoretical exams (midterm + final semester exam). |
| 13 | 2 | Studying several types of personnel dosimeters.                                                                                           | Personnel dosimeters.                                                                                                                               | Delivering lectures using information technology (computer). | Conducting practical and theoretical exams (midterm + final semester exam). |
| 14 | 2 | Explaining the CT dose index (CTDI), dose-length product                                                                                  | <ul style="list-style-type: none"> <li>• CT dose metrics and calculation.</li> <li>• Factors affecting dose in CT.</li> </ul>                       | Delivering lectures using information                        | Conducting practical and theoretical exams                                  |



|    |   |                                                                                                                |                                                                                                                          |                                                              |                                                                             |
|----|---|----------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|-----------------------------------------------------------------------------|
|    |   | (DLP), and effective dose and understanding the factors that affect dose in CT.                                |                                                                                                                          | technology (computer).                                       | (midterm + final semester exam).                                            |
| 15 | 2 | Studying the fluoroscopy dose to patient and staff and knowing the methods of minimizing the fluoroscopy dose. | <ul style="list-style-type: none"> <li>• Fluoroscopy dose.</li> <li>• Methods of minimizing fluoroscopy dose.</li> </ul> | Delivering lectures using information technology (computer). | Conducting practical and theoretical exams (midterm + final semester exam). |

### 11. Course Evaluation

The students will be assessed through a midterm exam (40 marks) + a final exam (60 marks), with a total of 100 marks.

### 12. Learning and Teaching Resources

|                                                                    |                                                                                                                                                                                                                                                                                                                                                             |
|--------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Required textbooks (curricular books, if any)                      | <ol style="list-style-type: none"> <li>1. Medical Imaging Physics, 4<sup>th</sup> Edition.</li> <li>2. Radiologic Science for Technologists Physics, Biology, and Protection, 7<sup>th</sup> Edition.</li> </ol>                                                                                                                                            |
| Main references (sources)                                          | <ol style="list-style-type: none"> <li>1. M. Radhi Al-Qurayshi and H. Qasim. Al-Mosawi "Radiation Physics and its applications in diagnostic radiological techniques", Middle Technical University (MTU), Iraq, (2015).</li> <li>2. Allissy-Roberts PJ, Williams J. Farr's "Physics for Medical Imaging". Elsevier Health Sciences; 2007 NOV 14.</li> </ol> |
| Recommended books and references (scientific journals, reports...) | <ol style="list-style-type: none"> <li>1. Journal of Medical Physics.</li> <li>2. Journal of Physica Medica.</li> </ol>                                                                                                                                                                                                                                     |
| Electronic References, Websites                                    | <a href="https://journals.lww.com/JOMP/pages/default.aspx">https://journals.lww.com/JOMP/pages/default.aspx</a>                                                                                                                                                                                                                                             |

## Course Description for Fundamentals of Radio-physics

|                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|---------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Course Name:                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Fundamentals of Radio-physics</b>                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 2. Course Code:                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| MTRA2105                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 3. Semester / Year:                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Annual System                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 4. Description Preparation Date:                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>2026-2025</b>                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 5. Available Attendance Forms:                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Daily attendance</b>                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 6. Number of Credit Hours (Total) / Number of Units (Total)         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 75hrs./ units3                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 7. Course administrator's name (mention all, if more than one name) |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Name: Reda Mohammed Ahmed<br>Email: redaelsaman8@gmail.com          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 8. Course Objectives                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Course Objectives</b>                                            | <ul style="list-style-type: none"> <li>How to generate tube voltage.</li> <li>Understanding the method of X-ray production.</li> <li>Explain the interactions of X-rays with matter.</li> <li>Understand the factors affecting image contrast.</li> <li>Explain the methods that lead to obtaining a high-quality image</li> </ul>                                                                                                                                                       |
| 9. Teaching and Learning Strategies                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Strategy</b>                                                     | <ul style="list-style-type: none"> <li>Asking questions and guiding students to discover the answers themselves.</li> <li>Using animations and videos to explain scientific concepts.</li> <li>Using discussions and interactive activities to increase engagement and understanding.</li> <li>Assessing students' progress through continuous evaluations like short questions.</li> <li>Allowing students to train in a real-world environment to acquire practical skills.</li> </ul> |

## 10. Course Structure

| Week | Hours | Required Learning Outcomes                                                                                                          | Unit or subject name                                   | Learning method                                               | Evaluation method                                                           |
|------|-------|-------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|---------------------------------------------------------------|-----------------------------------------------------------------------------|
| 1    | 5     | Explanation of how tube voltage is generated                                                                                        | Tube voltage production                                | Delivering lectures using information technology (computers). | Conducting practical and theoretical exams (midterm + final semester exam). |
| 2    | 5     | Studying the factors that affect the performance of the X-ray tube, such as voltage, current, and exposure time.                    | X-ray tube limitations                                 | Delivering lectures using information technology (computers). | Conducting practical and theoretical exams (midterm + final semester exam). |
| 3    | 5     | Studying how high temperatures can cause damage to the tube, such as deformation or damage to internal components.                  | Effect of heating and cooling on the X-ray tube        | Delivering lectures using information technology (computers). | Conducting practical and theoretical exams (midterm + final semester exam). |
| 4    | 5     | Defining X-rays and how they are produced in X-ray tubes.                                                                           | X-ray production                                       | Delivering lectures using information technology (computers). | Conducting practical and theoretical exams (midterm + final semester exam). |
| 5    | 5     | Understanding the characteristics of generated radiation and how it is produced.                                                    | Radiation characteristics                              | Delivering lectures using information technology (computers). | Conducting practical and theoretical exams (midterm + final semester exam). |
| 6    | 5     | The mechanism of fluorescence and phosphorescence.                                                                                  | Fluorescence and phosphorescence phenomena             | Delivering lectures using information technology (computers). | Conducting practical and theoretical exams (midterm + final semester exam). |
| 7    | 5     | Understanding the concept of the electron emission spectrum and knowing the factors that affect it.                                 | Factors affecting the electron emission spectrum.      | Delivering lectures using information technology (computers). | Conducting practical and theoretical exams (midterm + final semester exam). |
| 8    | 5     | Understanding the factors that affect the quantity of X-rays produced, such as material type, current, voltage, etc.                | Studying the factors affecting the quantity of X-rays. | Delivering lectures using information technology (computers). | Conducting practical and theoretical exams (midterm + final semester exam). |
| 9    | 5     | Studying the effect of the target material type (such as tungsten, molybdenum, or rhodium) on the purity and quality of the X-rays. | Studying the factors affecting the quality of X-rays   | Delivering lectures using information technology (computers). | Conducting practical and theoretical exams (midterm + final semester exam). |
| 10   | 5     | Understanding the relationship between                                                                                              | Interaction of X-rays with matter                      | Delivering lectures using                                     | Conducting practical and theoretical exams (midterm +                       |

|       |   |                                                                                                                                       |                                                         |                                                               |                                                                             |
|-------|---|---------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|---------------------------------------------------------------|-----------------------------------------------------------------------------|
|       |   | material properties (such as atomic number and density) and the quality of the produced X-rays.                                       |                                                         | information technology (computers).                           | final semester exam).                                                       |
| 11    | 5 | Knowing the types of interactions between X-rays and matter.                                                                          | Factors affecting image contrast                        | Delivering lectures using information technology (computers). | Conducting practical and theoretical exams (midterm + final semester exam). |
| 12    | 5 | Defining image contrast and how it affects the clarity of details and differentiation between different parts of the image.           | X-ray attenuation by the patient and contrast factors   | Delivering lectures using information technology (computers). | Conducting practical and theoretical exams (midterm + final semester exam). |
| 13    | 5 | Understanding the factors that lead to the absorption or scattering of X-rays, reducing their intensity before reaching the detector. | Studying absorption and its dependence on atomic number | Delivering lectures using information technology (computers). | Conducting practical and theoretical exams (midterm + final semester exam). |
| 14+15 | 5 | Understanding the factors that affect X-ray absorption.                                                                               | Ensuring quality of exposure factors                    | Delivering lectures using information technology (computers). | Conducting practical and theoretical exams (midterm + final semester exam). |

## 11. Course Evaluation

**The student will be assessed through a midterm exam (40 marks) + a final exam (60 marks), with a total of 100 marks.**

## 12. Learning and Teaching Resources

|                                                                    |                                                                                                                                                                                                                                                                                                                  |
|--------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Required textbooks (curricular books, if any)                      | <ol style="list-style-type: none"> <li>1. Radiologic Science for Technologists.</li> <li>2. Introduction to Radiologic and Imaging Sciences and Patient Care</li> </ol>                                                                                                                                          |
| Main references (sources)                                          | <ol style="list-style-type: none"> <li>1. Eugene D. Frank, Radiologic Science for Technologists, 12th Edition, 2019, Elsevier, ISBN: 978-0323566884.</li> <li>2. Arlene M. Adler, Introduction to Radiologic and Imaging Sciences and Patient Care, 8th Edition, 2020, Elsevier, ISBN: 978-0323581979</li> </ol> |
| Recommended books and references (scientific journals, reports...) | <ol style="list-style-type: none"> <li>1. Journal of Radiology and Medical Imaging.</li> <li>2. Journal of Medical Imaging.</li> </ol>                                                                                                                                                                           |
| Electronic References, Websites                                    | <a href="https://www.rsna.org">https://www.rsna.org</a>                                                                                                                                                                                                                                                          |

## Course Description for Radiological anatomy of lower limbs

|                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   |                             |                        |                          |
|---------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|-----------------------------|------------------------|--------------------------|
| 1. Course Name:                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   |                             |                        |                          |
| Radiological anatomy of lower limbs                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   |                             |                        |                          |
| 2. Course Code:                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   |                             |                        |                          |
| MTRA2104                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   |                             |                        |                          |
| 3. Semester / Year:                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   |                             |                        |                          |
| Annual System                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   |                             |                        |                          |
| 4. Description Preparation Date:                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   |                             |                        |                          |
| 2026-2025                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   |                             |                        |                          |
| 5. Available Attendance Forms:                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   |                             |                        |                          |
| Daily attendance                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   |                             |                        |                          |
| 6. Number of Credit Hours (Total) / Number of Units (Total)         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   |                             |                        |                          |
| 90hrs./ units4                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   |                             |                        |                          |
| 7. Course administrator's name (mention all, if more than one name) |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   |                             |                        |                          |
| Name: Fairouz Fathi Abdel Hassan                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   |                             |                        |                          |
| Email: fairouz.fathi@alayen.edu.iq                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   |                             |                        |                          |
| 8. Course Objectives                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   |                             |                        |                          |
| <b>Course Objectives</b>                                            | <ul style="list-style-type: none"> <li>Study the anatomical structure of the lower limbs, including bones, joints, muscles, and blood vessels.</li> <li>Analyze the radiological characteristics of bones and joints using X-rays, CT scans, and MRI.</li> <li>Identify ossification centers and the growth stages of long bones in the lower limbs.</li> <li>Interpret normal and pathological radiographic images, including fractures, infections, and joint diseases.</li> <li>Study the vascular anatomy of the lower limbs through radiographic imaging and analyze vascular diseases.</li> <li>Develop clinical radiographic interpretation skills for assessing injuries and various pathological conditions.</li> </ul> |                                   |                             |                        |                          |
| 9. Teaching and Learning Strategies                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   |                             |                        |                          |
| <b>Strategy</b>                                                     | <ul style="list-style-type: none"> <li>Asking questions and guiding students to discover the answers themselves.</li> <li>Using animations and videos to explain scientific concepts.</li> <li>Utilizing discussions and interactive activities to enhance engagement and understanding.</li> <li>Measuring students' progress through continuous assessments such as short quizzes.</li> <li>Allowing students to train in a real-world environment to acquire practical skills</li> </ul>                                                                                                                                                                                                                                      |                                   |                             |                        |                          |
| 10. Course Structure                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   |                             |                        |                          |
| <b>Week</b>                                                         | <b>Hours</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>Required Learning Outcomes</b> | <b>Unit or subject name</b> | <b>Learning method</b> | <b>Evaluation method</b> |

|     |    |                                                                                                                          |                                                                                                    |                                                                              |                                                            |
|-----|----|--------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|------------------------------------------------------------|
| 1   | 6  | Identify the components of the bony pelvis (pelvic girdle): sacrum, coccyx, and hip bones.                               | Bony pelvis (pelvic girdle): sacrum, coccyx & hip bones.                                           | Interactive lectures, anatomical images, radiographic and CT image analysis. | Written exams, radiographic image analysis of the pelvis.  |
| 2   | 6  | Recognize the anatomical differences between the male and female pelvis, identify radiological features of pelvic bones. | Differences between male & female pelvis, radiological features of the pelvic bones.               | Interactive lectures, clinical case studies using radiographic images.       | Written exams, radiographic image analysis of the pelvis.  |
| 3   | 6  | Identify the normal anatomy of the femur, determine its radiological features, and locate its ossification centers.      | Normal anatomy of the femur, radiological features of the femur bone, ossification centers.        | Interactive lectures, radiographic image analysis.                           | Written exams, radiographic image analysis of the femur.   |
| 4   | 6  | Identify the normal anatomy of the tibia, determine its radiological features, and locate its ossification centers.      | Normal anatomy of the tibia bone, radiological features of the tibia bone, ossification centers.   | Interactive lectures, radiographic image analysis.                           | Written exams, radiographic image analysis of the tibia.   |
| 5   | 6  | Identify the normal anatomy of the fibula, determine its radiological features, and locate its ossification centers.     | Normal anatomy of the fibula bone, radiological features of the fibula bone, ossification centers. | Interactive lectures, radiographic image analysis.                           | Written exams, radiographic image analysis of the fibula.  |
| 6   | 6  | Identify the normal anatomy of the patella, determine its radiological features, and locate its ossification center.     | Normal anatomy of the patella, radiological features of the patella, ossification center.          | Interactive lectures, radiographic image analysis.                           | Written exams, radiographic image analysis of the patella. |
| 7+8 | 12 | Identify the components of the foot: tarsals, metatarsals, and phalanges. Recognize their radiological features.         | Normal anatomy of the foot: tarsals, metatarsals & phalanges. Radiological features of the foot.   | Interactive lectures, radiographic image analysis.                           | Written exams, radiographic image analysis of the foot.    |
| 9   | 6  | Identify the type, articular surfaces, capsule, and ligaments of the hip joint.                                          | Hip joint: type of joint, articular surfaces, capsule & ligaments of the hip joint.                | Interactive lectures, MRI and radiographic image analysis.                   | Written exams, radiographic image analysis of              |

|    |   |                                                                                                                         |                                                                                                                  |                                                                        |                                                                |
|----|---|-------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|----------------------------------------------------------------|
|    |   |                                                                                                                         |                                                                                                                  |                                                                        | the hip joint.                                                 |
| 10 | 6 | Analyze the radiological features of the hip joint and study cases of hip joint dislocation.                            | Radiological features of the hip joint.<br>Dislocation of the hip joint.                                         | Clinical case studies using radiographic images, interactive lectures. | Written exams, radiographic image analysis of the hip joint.   |
| 11 | 6 | Identify the type, articular surfaces, capsule, and ligaments of the knee joint.                                        | Knee joint: type of joint, articular surfaces, capsule, ligaments.                                               | Interactive lectures, radiographic image analysis.                     | Written exams, radiographic image analysis of the knee joint.  |
| 12 | 6 | Analyze the internal structures of the knee joint and recognize its radiological features.                              | Internal structures of the knee joint.<br>Radiological features of the knee joint.                               | Interactive lectures, MRI and radiographic image analysis.             | Written exams, radiographic image analysis of the knee joint.  |
| 13 | 6 | Identify the type, articular surfaces, capsule, and ligaments of the ankle joint.<br>Analyze its radiological features. | Ankle joint: type of joint, articular surfaces, capsule, ligaments.<br>Radiological features of the ankle joint. | Interactive lectures, radiographic image analysis.                     | Written exams, radiographic image analysis of the ankle joint. |
| 14 | 6 | Identify the arterial supply of the lower limb and analyze radiographic images of blood vessels.                        | Blood supply of lower limbs: arteries of the lower limb.<br>Radiological features of the lower limb arteries.    | Interactive lectures, radiographic and angiographic image analysis.    | Written exams, radiographic image analysis of blood vessels.   |
| 15 | 6 | Identify the major veins of the lower limb and interpret normal and pathological venous radiographic images.            | Veins of the lower limb, radiological features of the lower limb veins.                                          | Interactive lectures, radiographic image analysis.                     | Written exams, radiographic image analysis of veins.           |

### 11. Course Evaluation

Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc

### 12. Learning and Teaching Resources

|                                                                    |                                                                                                                                                                                                                                                                                                                              |
|--------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Required textbooks (curricular books, if any)                      | Curriculum of the College of Medical and Health Technology/Baghdad                                                                                                                                                                                                                                                           |
| Main references (sources)                                          | 1. Kelley, L. L., & Petersen, C. (2018). <b><i>Sectional Anatomy for Imaging Professionals</i></b> . Third & fourth edition.<br>2. Ryan, S., McNicholas, M., & Eustace, S. (2011). <i>Anatomy for diagnostic imaging</i> .<br>3. Lazo, D. L. (2015). <i>Fundamentals of sectional anatomy: a diagnostic imaging approach</i> |
| Recommended books and references (scientific journals, reports...) | Ryan, S., McNicholas, M., & Eustace, S. (2011) <i>Anatomy for diagnostic imaging</i>                                                                                                                                                                                                                                         |
| Electronic References, Websites                                    | Studies published in pubmed and scopus                                                                                                                                                                                                                                                                                       |



## Course Description for Radiographic techniques for lower limbs

|                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-----------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Course Name:                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Radiographic techniques for lower limbs                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 2. Course Code:                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| MTRA2102                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 3. Semester / Year:                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Annual System                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 4. Description Preparation Date:                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 2026–2025                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 5. Available Attendance Forms:                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Daily attendance                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 6. Number of Credit Hours (Total) / Number of Units (Total)                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 105hrs./ units4                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 7. Course administrator's name (mention all, if more than one name)         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Name: Assist. lect. Milad Ali Talib                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Email: <a href="mailto:milad.a.talib@gmail.com">milad.a.talib@gmail.com</a> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 8. Course Objectives                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Course Objectives</b>                                                    | <ul style="list-style-type: none"> <li>• Students obtain valuable information about theoretical and applied radiography to benefit from it in hospitals</li> <li>• Use the theoretical and practical information provided to students to examine the patient and solve health problems that may be encountered during his work</li> <li>• Teach students how to direct the patient in a specific way to better image diseases of the lower limbs</li> <li>• Know how to take radiographs of each part of the different body parts.</li> <li>• Know the appropriate positions to show the different body parts.</li> <li>• Know how to use and control X-ray devices to obtain accuracy in clarity and thus accuracy in diagnosis.</li> </ul>                                                                                                                                                                                                                                                  |
| 9. Teaching and Learning Strategies                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Strategy</b>                                                             | <ul style="list-style-type: none"> <li>• The scientific material is determined according to the prescribed curriculum, with comprehensive lectures for the material containing the required topics and the necessary illustrations to support understanding.</li> <li>• The study material is presented using sophisticated PowerPoint presentations, with care taken to explain it in an interactive manner that engages students in the educational process through asking questions and group discussions.</li> <li>• After the lecture is completed, students are provided with a recorded video that includes a full explanation of the material, enabling them to review the content at any time. To ensure comprehension of the study material, understanding is measured through short daily tests or assigning students weekly assignments that require them to apply the concepts covered.</li> <li>• Interaction can be improved using modern educational tools such as</li> </ul> |

|  |                                                                                                                                                                                                            |
|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>interactive electronic tests.</p> <ul style="list-style-type: none"> <li>Encouraging students to participate actively by awarding additional marks for contributions during the explanation.</li> </ul> |
|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## 10. Course Structure

| Week | Hours | Required Learning Outcomes                                                                        | Unit or subject name                                        | Learning method                 | Evaluation method      |
|------|-------|---------------------------------------------------------------------------------------------------|-------------------------------------------------------------|---------------------------------|------------------------|
| 1st  | 7     | Teaching students how to guide the patient through imaging to best view diseases for the lecture. | Pelvis                                                      | Theoretical lecture + Practical | Quizzes and Oral Exams |
| 2nd  | 7     | Teaching students how to guide the patient through imaging to best view diseases for the lecture. | Ilium                                                       | Theoretical lecture + Practical | Quizzes and Oral Exams |
| 3rd  | 7     | Teaching students how to guide the patient through imaging to best view diseases for the lecture. | Symphysis pubis                                             | Theoretical lecture + Practical | Quizzes and Oral Exams |
| 4th  | 7     | Teaching students how to guide the patient through imaging to best view diseases for the lecture. | Sacro-iliac joints                                          | Theoretical lecture + Practical | Quizzes and Oral Exams |
| 5th  | 7     | Teaching students how to guide the patient through imaging to best view diseases for the lecture. | Acetabulum                                                  | Theoretical lecture + Practical | Quizzes and Oral Exams |
| 6th  | 7     | Teaching students how to guide the patient through imaging to best view diseases for the lecture. | Femur                                                       | Theoretical lecture + Practical | Quizzes and Oral Exams |
| 7th  | 7     | Teaching students how to guide the patient through imaging to best view                           | hip joint, AP, Lateral, frog-leg infro-superior view, shown | Theoretical lecture + Practical | Quizzes and Oral Exams |

|      |   |                                                                                                   |                                                                |                                 |                        |
|------|---|---------------------------------------------------------------------------------------------------|----------------------------------------------------------------|---------------------------------|------------------------|
|      |   | diseases for the lecture.                                                                         | structure                                                      |                                 |                        |
| 8th  | 7 | Teaching students how to guide the patient through imaging to best view diseases for the lecture. | Tibia & fibula, AP, Lateral                                    | Theoretical lecture + Practical | Quizzes and Oral Exams |
| 9th  | 7 | Teaching students how to guide the patient through imaging to best view diseases for the lecture. | Knee joint AP, lateral, skyline for patella, erect AP          | Theoretical lecture + Practical | Quizzes and Oral Exams |
| 10th | 7 | Teaching students how to guide the patient through imaging to best view diseases for the lecture. | Patella positions                                              | Theoretical lecture + Practical | Quizzes and Oral Exams |
| 11th | 7 | Teaching students how to guide the patient through imaging to best view diseases for the lecture. | Foot, AP, lateral, oblique, shown structure,                   | Theoretical lecture + Practical | Quizzes and Oral Exams |
| 12th | 7 | Teaching students how to guide the patient through imaging to best view diseases for the lecture. | Metatarsal–phalangeal sesamoid bones                           | Theoretical lecture + Practical | Quizzes and Oral Exams |
| 13th | 7 | Teaching students how to guide the patient through imaging to best view diseases for the lecture. | Ankle joint, AP, lateral, oblique, oblique & AP with inversion | Theoretical lecture + Practical | Quizzes and Oral Exams |
| 14th | 7 | Teaching students how to guide the patient through imaging to best view diseases for the lecture. | Subtalar joints                                                | Theoretical lecture + Practical | Quizzes and Oral Exams |
| 15th | 7 | Teaching students how to guide the patient through imaging to best view diseases for the          | Calcaneum positions                                            | Theoretical lecture + Practical | Quizzes and Oral Exams |

|                                                                                                                       |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |  |  |
|-----------------------------------------------------------------------------------------------------------------------|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|
|                                                                                                                       |  | lecture.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |  |  |
| <b>11. Course Evaluation</b>                                                                                          |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |  |  |
| The students will be assessed through a midterm exam (40 marks) + a final exam (60 marks), with a total of 100 marks. |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |  |  |
| <b>12. Learning and Teaching Resources</b>                                                                            |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |  |  |
| Required textbooks (curricular books, if any)                                                                         |  | Books recommended by the Ministry of Higher Education and Scientific Research for the subject of Radiological Imaging Techniques.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |  |  |
| Main references (sources)                                                                                             |  | <ul style="list-style-type: none"> <li>Whitley, A. S., Jefferson, G., Holmes, K., Sloane, C., Anderson, &amp; Hoadley, G.(2015) .Clark's Positioning in Radiography 13E. crc Press.</li> <li>Bontrager, K. L., &amp; Lampignano, J. (2013). Bontrager's handbook of radiographic positioning and techniques. Elsevier Health Sciences</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |  |
| Recommended books and references (scientific journals, reports...)                                                    |  | Research Gate Journal of Scientific Research                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |  |  |
| Electronic References, Websites                                                                                       |  | <ol style="list-style-type: none"> <li><b>Radiopaedia:</b> A free educational website that contains articles and clinical images in the field of medical imaging. Link: <a href="http://www.radiopaedia.org">www.radiopaedia.org</a></li> <li><b>American College of Radiology (ACR):</b> Contains guidelines and references related to medical imaging and clinical practices.Link: <a href="http://www.acr.org">www.acr.org</a></li> <li><b>RSNA (Radiological Society of North America):</b> Provides educational resources, research, and recent articles on medical imaging.Link: <a href="http://www.rsna.org">www.rsna.org</a></li> <li><b>National Institutes of Health (NIH) - Imaging:</b> A scientific platform containing research and reports on the applications of medical imaging. Link: <a href="http://www.nih.gov">www.nih.gov</a></li> <li><b>Physics Open Resources by IAEA:</b> Educational resources on medical physics and imaging technologies provided by the International Atomic Energy Agency. Link: <a href="http://www.iaea.org">www.iaea.org</a></li> <li><b>PubMed:</b> A scientific database that contains research papers and articles in the field of medical imaging. Link: <a href="http://pubmed.ncbi.nlm.nih.gov">pubmed.ncbi.nlm.nih.gov</a></li> <li><b>Computed Tomography (CT) Basics:</b> A platform that focuses on explaining the principles of computed tomography in a simplified manner. Link: <a href="http://www.ctisus.com">www.ctisus.com</a></li> <li><b>European Society of Radiology (ESR):</b> Offers articles and training courses related to advancements in medical imaging. Link: <a href="http://www.myesr.org">www.myesr.org</a></li> </ol> |  |  |  |



## Course Description for Arabic Language

|                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1. Course name:</b>                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Arabic Language                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>2. Course code:</b>                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| MTRA2109                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>3. Semester/Year:</b>                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Annual System                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>4. Date this description was prepared:</b>                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 2026-2025                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>5. Available forms of attendance:</b>                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Daily attendance                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>6. Number of study hours</b>                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 30hrs./ units2                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>7. Name of the course supervisor: (If more than one name is mentioned)</b>                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Musaddiq Murad Abdul Razzaq Al-Matar<br><a href="mailto:muosadqmurad@gmail.com">muosadqmurad@gmail.com</a> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>8. Course objectives</b>                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Objectives of the course</b>                                                                            | <p><b>General objective:</b><br/>To review, master and learn the Arabic language</p> <p><b>Specific objectives:</b></p> <ul style="list-style-type: none"> <li>• The course aims to provide the most important vocabulary of the Arabic language (in grammatical and morphological issues) in a sufficient and comprehensive manner, which affects the student's life and accompanies him in the future.</li> <li>• Introducing the student to the basics of correct writing (such as differentiating between Arabic sentences and knowing their types, knowing the original and secondary diacritics, knowing the abrogators of the nominal sentence, and differentiating between sentences morphologically in terms of masculine and feminine, etc.).</li> <li>• The course aims to provide the most important vocabulary (in spelling and expressive issues) in general.</li> <li>• Introducing the student to writing numbers in the Arabic language, and knowing how to write the hamza in its various types. Teaching students to differentiate between the tied taa and the open taa, as well as the differentiation between the dad and the thaa, knowing punctuation marks, and the most common mistakes in the Arabic language</li> </ul> |
| <b>9. Teaching and learning strategies</b>                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Strategy</b>                                                                                            | <ul style="list-style-type: none"> <li>- Interactive lectures, dialogue, discussion and brainstorming methods</li> <li>- Questions and discussions.</li> <li>- Encouraging students to learn the most important rules of the Arabic language (grammatical and morphological)</li> <li>- Teaching students how to employ general Arabic rules (in spelling and expressive matters) in their writing</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

**10. Course structure**

| Evaluation Method      | Learning Method      | Unit or Topic Name                                                                                       | Required Learning Outcomes | Hours | Week |
|------------------------|----------------------|----------------------------------------------------------------------------------------------------------|----------------------------|-------|------|
| Oral and written exams | Interactive lectures | An introductory lecture and an overview of the types of Arabic words and how to distinguish between them | Knowledge and description  | 2     | 1    |
| Oral and written exams | Interactive lectures | Noun, verb and particle signs and how to differentiate between them                                      | Knowledge and description  | 2     | 2    |
| Oral and written exams | Interactive lectures | Original diacritical marks                                                                               | Knowledge and description  | 2     | 3    |
| Oral and written exams | Interactive lectures | Subordinate diacritical marks                                                                            | Knowledge and description  | 2     | 4    |
| Oral and written exams | Interactive lectures | Common grammatical errors                                                                                | Knowledge and description  | 2     | 5    |
| Oral and written exams | Interactive lectures | The Arabic sentence and its types (the verbal sentence) and the signs of each type                       | Knowledge and description  | 2     | 6    |
| Oral and written exams | Interactive lectures | (the nominal sentence)                                                                                   | Knowledge and description  | 2     | 7    |
| Oral and written exams | Interactive lectures | Nominal sentence nullifiers (kana and its sisters)                                                       | Knowledge and description  | 2     | 8    |
| Oral and written exams | Interactive lectures | Nominal sentence nullifiers (inna and its sisters)                                                       | Knowledge and description  | 2     | 9    |
| Oral and written exams | Interactive lectures | Writing the hamza in Arabic                                                                              | Knowledge and description  | 2     | 10   |
| Oral and written exams | Interactive lectures | The tied taa and how to write it                                                                         | Knowledge and description  | 2     | 11   |
| Oral and written exams | Interactive lectures | The hamza of connection and the hamza of separation                                                      | Knowledge and description  | 2     | 12   |
| Oral and written exams | Interactive lectures | Punctuation marks                                                                                        | Knowledge and description  | 2     | 13   |
| Oral and               | Interactive          | The open taa and how                                                                                     | Knowledge and              | 2     | 14   |

|                        |                      |                                   |                           |   |    |
|------------------------|----------------------|-----------------------------------|---------------------------|---|----|
| written exams          | lectures             | to write it                       | description               |   |    |
| Oral and written exams | Interactive lectures | The difference between Ḍād and Ḍā | Knowledge and description | 2 | 15 |

### 11. Course Evaluation

The grade is distributed out of 100 according to the tasks assigned to the student, and 25 points are divided into the semester exam, 5 points for activities and assignments, and 70 points for the final exam.

### 12. Learning and teaching resources

|                                                                                                                                                                                                                         |                                                                               |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|
| Common errors in the Arabic language, without an author, a method. Juwaidi, Darwish Mahmoud, The origins of the Arabic language, its vocabulary, and the meaning of words and terms Al-Maktaba Al-Asriya, Beirut, 2020. | Required textbooks (methodology if any)                                       |
| Juma, Mahmoud Abdel Razzaq, Common linguistic errors, a linguistic study, Tabana for Publishing and Distribution, 2019.                                                                                                 | Main references (sources)                                                     |
| "Language and Literature" magazine, a refereed academic journal issued by the Department of Arabic Language and Literature - Faculty of Arts and Languages - University of Algiers.                                     | Recommended supporting books and references (scientific journals, reports...) |
| Forsa Team, Common in the Arabic Language, Forsa website, 10/27/2024, <a href="https://www.for9a.com/learn/">https://www.for9a.com/learn/</a>                                                                           | Electronic references, Internet sites                                         |



| 1. Course Name:                                                                   |                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                         |                         |                                                                 |                                                               |
|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|-----------------------------------------------------------------|---------------------------------------------------------------|
| Computer and Artificial Intelligence                                              |                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                         |                         |                                                                 |                                                               |
| 2. Course Code:                                                                   |                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                         |                         |                                                                 |                                                               |
| MTRA2107                                                                          |                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                         |                         |                                                                 |                                                               |
| 3. Semester / Year:                                                               |                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                         |                         |                                                                 |                                                               |
| Annual System                                                                     |                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                         |                         |                                                                 |                                                               |
| 4. Description Preparation Date:                                                  |                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                         |                         |                                                                 |                                                               |
| 1 / 10/ 2025                                                                      |                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                         |                         |                                                                 |                                                               |
| 5. Available Attendance Forms:                                                    |                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                         |                         |                                                                 |                                                               |
| Daily attendance                                                                  |                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                         |                         |                                                                 |                                                               |
| 6. Number of Credit Hours (Total) / Number of Units (Total):                      |                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                         |                         |                                                                 |                                                               |
| 60 hours (30 theoretical + 30 practical) / 2 units                                |                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                         |                         |                                                                 |                                                               |
| 7. Course administrator's name (mention all, if more than one name)               |                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                         |                         |                                                                 |                                                               |
| Name: MS.C Wassim Talib Hatem                                                     |                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                         |                         |                                                                 |                                                               |
| Email: <a href="mailto:wissam.talib@alayen.edu.iq">wissam.talib@alayen.edu.iq</a> |                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                         |                         |                                                                 |                                                               |
| 8. Course Objectives                                                              |                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                         |                         |                                                                 |                                                               |
| Course Objectives                                                                 |                                                                                                                    | <p>–Security and Networks:</p> <p>Understanding the basics of networks, their types, and components.</p> <p>–Introduction to Artificial Intelligence:</p> <p>Understanding the definition of AI, its history, technologies, and associated ethical challenges.</p> <p>–E-Commerce:</p> <p>Understanding electronic banking services such as phone banking, e-messaging, and alerts.</p> |                         |                                                                 |                                                               |
| 9. Teaching and Learning Strategies                                               |                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                         |                         |                                                                 |                                                               |
| Strategy                                                                          | <p>- Interactive lectures</p> <p>- Practical review</p> <p>- Practical training</p> <p>- Lecture documentation</p> |                                                                                                                                                                                                                                                                                                                                                                                         |                         |                                                                 |                                                               |
| 10. Course Structure                                                              |                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                         |                         |                                                                 |                                                               |
| Week                                                                              | Hours                                                                                                              | Required Learning Outcomes                                                                                                                                                                                                                                                                                                                                                              | Unit or subject name    | Learning method                                                 | Evaluation method                                             |
| <b>Syllabus of The Theoretical Course</b>                                         |                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                         |                         |                                                                 |                                                               |
| 1                                                                                 | 2 hour                                                                                                             | Understand the basics networks, their types, and components.                                                                                                                                                                                                                                                                                                                            | Security and Networking | Lectures, demonstrations, group discussions.                    | Written tests, practical troubleshooting assessment           |
| 2                                                                                 | 2 hour                                                                                                             | Understand electronic banking services like phone banking, SMS alerts.                                                                                                                                                                                                                                                                                                                  | E-commerce              | Lectures, case studies , discussions on practical applications. | Written exams, presentations on practical e-banking examples. |

|   |        |                                                                                 |                          |                                                                     |                                                                |
|---|--------|---------------------------------------------------------------------------------|--------------------------|---------------------------------------------------------------------|----------------------------------------------------------------|
| 3 | 2 hour | Identify common hardware and software problems in computer                      | Computer Troubleshooting | Workshops, hands-on practical exercises.                            | Practical tests, assessment of troubleshooting tools use.      |
| 4 | 2 hour | Understand the definition and history of AI.                                    | Introduction to AI       | Interactive lectures, historical review of AI, video presentations. | Written exams, research projects on AI history and techniques. |
| 5 | 2 hour | Explore the role of AI in smartphones and virtual assistants.                   | AI in Daily Life         | Practical sessions on AI applications in smartphones                | Short reports on AI use in daily life.                         |
| 6 | 2 hour | Discover AI applications in education, healthcare, finance, and transportation. | Applications of AI       | Case studies, group discussions, presentations.                     | Research reports, presentations on AI applications.            |
| 7 | 2 hour | Understand AI's impact on society and international relations                   | AI and Society           | Lectures, interactive discussions on AI's societal impact.          | Analytical reports, group discussions and evaluations.         |
| 8 | 2 hour | Discuss AI ethics, privacy, and its effect on the job market                    | Ethical Challenges in AI | Workshops, discussions on AI ethics.                                | Research papers, group discussions, case study evaluations.    |
| 9 | 2 hour | Explore future trends and emerging AI technologies.                             | The Future of AI         | Interactive lectures, exploration of recent research.               | Research projects, presentations on future AI trends.          |

### 11. Course Evaluation

60% theoretical and 40% practical

### 12. Learning and Teaching Resources

|                                                                    |                                                                                                                                |
|--------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| Required textbooks (curricular books, if any)                      | <b>"Artificial Intelligence: A Modern Approach"</b> by Stuart Russell, Peter Norvig                                            |
| Main references (sources)                                          | <b>"Introduction to AI Robotics"</b> by Robin Murphy                                                                           |
| Recommended books and references (scientific journals, reports...) | Articles from <b>IEEE Computer Society</b><br>AI industry reports from <b>McKinsey &amp; Company</b>                           |
| Electronic References, Websites                                    | <b>edX.org</b> (Open courses on e-commerce and network security)<br><b>arxiv.org</b> (AI and machine learning research papers) |

## Course Description for Conventional Radiological Equipment Techniques

|                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Course Name:                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Conventional Radiological Equipment Techniques</b>               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 2. Course Code:                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| MTRA2201                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 3. Semester / Year:                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Annual System                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 4. Description Preparation Date:                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 2026-2025                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 5. Available Attendance Forms:                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Daily attendance</b>                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 6. Number of Credit Hours (Total) / Number of Units (Total)         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 105hrs./ units4                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 7. Course administrator's name (mention all, if more than one name) |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Name: Hussein abed dakhil                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Email: hussaien.abed@gmail.com                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 8. Course Objectives                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Course Objectives</b>                                            | <ul style="list-style-type: none"> <li><b>Understanding the Fundamental Principles of Conventional Radiographic Techniques:</b> Providing students with theoretical knowledge on how conventional radiographic equipment operates and the mechanisms of radiographic image production.</li> <li><b>Identifying Types of Conventional Radiographic Equipment:</b> Studying the different designs of stationary and mobile devices, understanding their functions, and exploring their clinical applications.</li> <li><b>Acquiring Equipment Operation Skills:</b> Training students to efficiently and safely operate conventional radiographic equipment, focusing on correct procedures to ensure high-quality diagnostic images.</li> <li><b>Enhancing Radiation Safety Awareness:</b> Introducing students to radiation protection principles and applying international standards to ensure the safety of patients and healthcare workers.</li> <li><b>Developing Equipment Maintenance Skills:</b> Teaching students the basic steps of routine maintenance to ensure consistent performance and high-quality imaging.</li> <li><b>Analyzing and Interpreting Radiographic Images:</b> Developing students' ability to read images produced by conventional radiographic equipment and use them in diagnostic processes.</li> <li><b>Keeping Up with Technological Advancements:</b> Familiarizing students with the latest innovations and technologies in conventional radiographic imaging and their impact on professional practice.</li> <li><b>Enhancing Practical and Professional Skills:</b> Preparing students to work in clinical environments by developing their hands-on skills and ensuring adherence to ethical and professional standards.</li> </ul> |

## 9. Teaching and Learning Strategies

|                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
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| <b>Strategy</b> | <p><b>1. Interactive Theoretical Lectures:</b></p> <ul style="list-style-type: none"> <li>Presenting fundamental concepts and techniques related to conventional radiographic equipment using visual aids such as PowerPoint slides and illustrations.</li> <li>Encouraging student participation in discussions and questions to enhance understanding.</li> </ul> <p><b>2. Practical Training and Laboratories:</b></p> <ul style="list-style-type: none"> <li>Providing hands-on sessions that allow students to interact directly with conventional radiographic equipment.</li> <li>Implementing practical scenarios that simulate clinical cases to develop technical skills.</li> </ul> <p><b>3. Project-Based Learning:</b></p> <ul style="list-style-type: none"> <li>Assigning students research or practical projects, such as preparing reports on the working mechanisms of specific devices or comparing different types of equipment.</li> </ul> <p><b>4. Interactive Learning Using Modern Technologies:</b></p> <ul style="list-style-type: none"> <li>Utilizing advanced technological tools such as digital simulations, educational videos, and online assessments to reinforce theoretical and practical understanding.</li> </ul> <p><b>5. Collaborative Learning:</b></p> <ul style="list-style-type: none"> <li>Encouraging teamwork by forming student groups to solve problems, exchange ideas, and carry out group activities.</li> </ul> <p><b>6. Case Studies:</b></p> <ul style="list-style-type: none"> <li>Analyzing real-life cases involving conventional radiographic equipment to enhance critical and applied thinking skills.</li> </ul> <p><b>7. Continuous Assessment and Reviews:</b></p> <ul style="list-style-type: none"> <li>Conducting quizzes and periodic discussions to assess students' progress and comprehension.</li> <li>Allocating time at the end of each lecture or practical session to review key points and answer students' questions.</li> </ul> <p><b>8. Additional Educational Resources:</b></p> <ul style="list-style-type: none"> <li>Providing comprehensive lecture summaries and accredited references to support self-learning.</li> <li>Sharing recorded educational videos to illustrate device operation and procedural techniques.</li> </ul> |
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## 10. Course Structure

| Week | Hours | Required Learning Outcomes                                           | Unit or subject name    | Learning method         | Evaluation method       |
|------|-------|----------------------------------------------------------------------|-------------------------|-------------------------|-------------------------|
| 1    | 2     | Understanding the Main Components of the X-ray Machine and Its Types | x-ray machine system    | Theoretical + Practical | Quizzes with Oral Exams |
| 2    | 2     | Understanding the Operation of the High-Voltage Generator            | High voltage generators | Theoretical + Practical | Quizzes with Oral Exams |
| 3    | 2     | Understanding the                                                    | x-ray tube              | Theoretical +           | Quizzes with Oral       |

|    |   |                                                                                  |                               |                         |                         |
|----|---|----------------------------------------------------------------------------------|-------------------------------|-------------------------|-------------------------|
|    |   | Operation of the X-ray Tube                                                      |                               | Practical               | Exams                   |
| 4  | 2 | Identifying the Common Issues Facing the X-ray Tube and How to Address Them      | x-ray tube failure            | Theoretical + Practical | Quizzes with Oral Exams |
| 5  | 2 | Understanding the Basic Components of the Radiographic Plate                     | Construction of film          | Theoretical + Practical | Quizzes with Oral Exams |
| 6  | 2 | Understanding the Function of Filters                                            | Filter                        | Theoretical + Practical | Quizzes with Oral Exams |
| 7  | 2 | Identifying the Main Types of Filters                                            | Grid types                    | Theoretical + Practical | Quizzes with Oral Exams |
| 8  | 2 | Understanding the Nature of Digital Radiography                                  | Digital radiography           | Theoretical + Practical | Quizzes with Oral Exams |
| 9  | 2 | Understanding Digital Radiography Systems                                        | Direct to Digital radiography | Theoretical + Practical | Quizzes with Oral Exams |
| 10 | 2 | Identifying the Key Factors Affecting Image Quality                              | Image quality                 | Theoretical + Practical | Quizzes with Oral Exams |
| 11 | 2 | Identifying the Key Components of the Mammography Equipment                      | Mammography                   | Theoretical + Practical | Quizzes with Oral Exams |
| 12 | 2 | Understanding the Operation of Digital Mammography Equipment                     | Digital Mammography           | Theoretical + Practical | Quizzes with Oral Exams |
| 13 | 2 | Understanding the Operation of Fluoroscopy Equipment                             | Fluoroscopy                   | Theoretical + Practical | Quizzes with Oral Exams |
| 14 | 2 | Understanding the Operation of Bone Density Measurement Equipment                | Bone density scan             | Theoretical + Practical | Quizzes with Oral Exams |
| 15 | 2 | Understanding the Operation of Panoramic Imaging Equipment for the Face and Jaws | Orthopantomogram              | Theoretical + Practical | Quizzes with Oral Exams |

## 11. Course Evaluation

Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc

## 12. Learning and Teaching Resources

Required textbooks (curricular books, if any)

1. Stewart Carlyle Bushong, ***“Radiologic Science for Technologists Physics, Biology, and Protection”*** Elsevier, Inc. , 7<sup>th</sup> edition, 2017.

|                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Main references (sources)                                          | <p>2. Chris Guy &amp; Dominic ffytche, <b><i>“An Introduction to The Principles of Medical Imaging”</i></b>, Imperial College Press, 2005.</p> <p>3. Perry Sprawls, <b><i>“Physical principles of medical imaging”</i></b>, 2<sup>nd</sup> Edition 1996</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Recommended books and references (scientific journals, reports...) | <p style="text-align: center;"><b>Recommended Books:</b></p> <ol style="list-style-type: none"> <li>1. Christensen, E. E., &amp; Curry, T. S. (2013).<br/><b>Introduction to the Physics of Diagnostic Radiology.</b></li> <li>2. Fauber, T. L. (2016).<br/><b>Radiographic Imaging and Exposure.</b></li> <li>3. Seeram, E. (2017).<br/><b>Digital Radiography: Physical Principles and Quality Control.</b></li> <li>4. Hendee, W. R., &amp; Ritenour, E. R. (2002).<br/><b>Medical Imaging Physics.</b></li> </ol> <p style="text-align: center;"><b>Recommended Journals:</b></p> <ol style="list-style-type: none"> <li>1. <b>Radiology Journal</b> <ul style="list-style-type: none"> <li>○ The official journal of the Radiological Society of North America (RSNA), featuring recent research and reports in the field of medical imaging.</li> <li>○ Link: <a href="http://www.rsna.org">www.rsna.org</a></li> </ul> </li> <li>2. <b>Journal of Radiology and Imaging</b> <ul style="list-style-type: none"> <li>○ Publishes research articles and reviews on advancements in radiographic imaging techniques.</li> </ul> </li> <li>3. <b>European Journal of Radiology</b> <ul style="list-style-type: none"> <li>○ A scientific journal covering all aspects of both traditional and modern medical imaging.</li> <li>○ Link: <a href="http://www.ejradiology.com">www.ejradiology.com</a></li> </ul> </li> <li>4. <b>British Journal of Radiology (BJR)</b> <ul style="list-style-type: none"> <li>○ A well-known journal offering research and reports on medical physics and radiographic imaging techniques.</li> <li>○ Link: <a href="http://www.birpublications.org">www.birpublications.org</a></li> </ul> </li> </ol> <p style="text-align: center;"><b>Supporting Reports:</b></p> <ol style="list-style-type: none"> <li>1. <b>IAEA Publications</b> <ul style="list-style-type: none"> <li>○ Educational reports and studies from the International Atomic Energy Agency on radiation safety and radiographic equipment techniques.</li> <li>○ Link: <a href="http://www.iaea.org">www.iaea.org</a></li> </ul> </li> <li>2. <b>NCRP Reports (National Council on Radiation Protection and Measurements)</b> <ul style="list-style-type: none"> <li>○ Reports offering international recommendations and standards related to radiation protection.</li> <li>○ Link: <a href="http://www.ncrponline.org">www.ncrponline.org</a></li> </ul> </li> <li>3. <b>WHO Publications on Radiation Safety</b> <ul style="list-style-type: none"> <li>○ Publications from the World Health Organization on the safe use of radiographic equipment.</li> <li>○ Link: <a href="http://www.who.int">www.who.int</a></li> </ul> </li> <li>4. <b>ACR Practice Guidelines and Technical Standards</b> <ul style="list-style-type: none"> <li>○ Practice standards and technical guidelines provided by the American College of Radiology (ACR).</li> </ul> </li> </ol> |

|                     |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|---------------------|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                     |             | <ul style="list-style-type: none"> <li>○ Link: <a href="http://www.acr.org">www.acr.org</a></li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Electronic Websites | References, | <p style="text-align: center;"><b>Specialized Educational Websites in Radiology:</b></p> <ol style="list-style-type: none"> <li><b>1. Radiopaedia</b> <ul style="list-style-type: none"> <li>○ A comprehensive educational library containing articles and clinical images related to medical diagnostics.</li> <li>○ Link: <a href="http://www.radiopaedia.org">www.radiopaedia.org</a></li> </ul> </li> <li><b>2. American College of Radiology (ACR)</b> <ul style="list-style-type: none"> <li>○ A site rich in clinical guidelines, scientific articles, and radiological practice standards.</li> <li>○ Link: <a href="http://www.acr.org">www.acr.org</a></li> </ul> </li> <li><b>3. Radiological Society of North America (RSNA)</b> <ul style="list-style-type: none"> <li>○ Provides educational resources and recent research in all areas of medical imaging.</li> <li>○ Link: <a href="http://www.rsna.org">www.rsna.org</a></li> </ul> </li> <li><b>4. Computed Tomography (CT) Basics</b> <ul style="list-style-type: none"> <li>○ An educational platform dedicated to explaining the principles of conventional and computed tomography imaging in a simplified manner.</li> <li>○ Link: <a href="http://www.ctisus.com">www.ctisus.com</a></li> </ul> </li> <li><b>5. Physics Open Resources by IAEA</b> <ul style="list-style-type: none"> <li>○ Open educational resources provided by the International Atomic Energy Agency in the field of medical physics and imaging techniques.</li> <li>○ Link: <a href="http://www.iaea.org">www.iaea.org</a></li> </ul> </li> </ol> <p style="text-align: center;"><b>Scientific Databases:</b></p> <ol style="list-style-type: none"> <li><b>1. PubMed</b> <ul style="list-style-type: none"> <li>○ A database containing millions of scientific articles and research studies related to medical imaging.</li> <li>○ Link: <a href="http://pubmed.ncbi.nlm.nih.gov">pubmed.ncbi.nlm.nih.gov</a></li> </ul> </li> <li><b>2. ScienceDirect</b> <ul style="list-style-type: none"> <li>○ A scientific library offering research articles on radiological physics and medical device techniques.</li> <li>○ Link: <a href="http://www.sciencedirect.com">www.sciencedirect.com</a></li> </ul> </li> <li><b>3. SpringerLink</b> <ul style="list-style-type: none"> <li>○ A platform offering books and articles specialized in medical physics and radiographic imaging techniques.</li> <li>○ Link: <a href="http://link.springer.com">link.springer.com</a></li> </ul> </li> </ol> <p style="text-align: center;"><b>International Standards and Guidelines Websites:</b></p> <ol style="list-style-type: none"> <li><b>1. National Council on Radiation Protection and Measurements (NCRP)</b> <ul style="list-style-type: none"> <li>○ Provides reports and recommendations on radiation protection and device usage standards.</li> <li>○ Link: <a href="http://www.ncrponline.org">www.ncrponline.org</a></li> </ul> </li> <li><b>2. World Health Organization (WHO) – Radiation Safety</b> <ul style="list-style-type: none"> <li>○ A section dedicated to radiation safety and medical applications.</li> <li>○ Link: <a href="http://www.who.int">www.who.int</a></li> </ul> </li> </ol> |

3. **European Society of Radiology (ESR)**

- An educational platform offering scientific articles and training courses on developments in medical imaging.
- Link: [www.myesr.org](http://www.myesr.org)

**Websites Supporting E-Learning:**

1. **Khan Academy – Physics**

- Offers simplified lessons in basic physics that support the understanding of radiographic imaging techniques.
- Link: [www.khanacademy.org](http://www.khanacademy.org)

2. **MIT OpenCourseWare – Medical Imaging**

- Free courses from MIT on medical imaging techniques and principles.
- Link: [ocw.mit.edu](http://ocw.mit.edu)

3. **YouTube Channels (RSNA & Radiology Education)**

- Channels offering free educational videos explaining conventional radiographic devices.



## Course Description for Radiographic techniques for upper limbs

|                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|---------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Course Name:                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Radiographic techniques for upper limbs                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 2. Course Code:                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| MTRA2102                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 3. Semester / Year:                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Annual System                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 4. Description Preparation Date:                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 2026–2025                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 5. Available Attendance Forms:                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Daily attendance                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 6. Number of Credit Hours (Total) / Number of Units (Total)         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 105hrs./ units4                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 7. Course administrator's name (mention all, if more than one name) |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Name: Assist. lect. Milad Ali Talib                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Email: milad.a.talib@gmail.com                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 8. Course Objectives                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Course Objectives</b>                                            | <ul style="list-style-type: none"> <li>Students obtain valuable information about theoretical and applied radiography to benefit from it in hospitals</li> <li>Use the theoretical and practical information provided to students to examine the patient and solve health problems that may be encountered during his work</li> <li>Teach students how to direct the patient in a specific way to better image diseases of the upper limbs</li> <li>Know how to take radiographs of each part of the different body parts.</li> <li>Know the appropriate positions to show the different body parts.</li> <li>Know how to use and control X-ray devices to obtain accuracy in clarity and thus accuracy in diagnosis.</li> </ul>                                                                                                                                                                                                                                                                                    |
| 9. Teaching and Learning Strategies                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Strategy</b>                                                     | <ul style="list-style-type: none"> <li>The scientific material is determined according to the prescribed curriculum, with comprehensive lectures for the material containing the required topics and the necessary illustrations to support understanding.</li> <li>The study material is presented using sophisticated PowerPoint presentations, with care taken to explain it in an interactive manner that engages students in the educational process through asking questions and group discussions.</li> <li>After the lecture is completed, students are provided with a recorded video that includes a full explanation of the material, enabling them to review the content at any time. To ensure comprehension of the study material, understanding is measured through short daily tests or assigning students weekly assignments that require them to apply the concepts covered.</li> <li>Interaction can be improved using modern educational tools such as interactive electronic tests.</li> </ul> |

- Encouraging students to participate actively by awarding additional marks for contributions during the explanation.
- Allocating a short time at the end of each lecture to answer students' inquiries and direct questions to them to ensure the clarity of the material

## 10. Course Structure

| Week | Hours | Required Learning Outcomes                                                                        | Unit or subject name                                                                                                                                                                           | Learning method     | Evaluation method      |
|------|-------|---------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|------------------------|
| 1st  | 7     | Teaching students how to guide the patient through imaging to best view diseases for the lecture. | <ul style="list-style-type: none"> <li>• Terminology,</li> <li>• Body planes, section,</li> <li>• lines, body position special projections</li> </ul>                                          | Lecture + Practical | Quizzes and Oral Exams |
| 2nd  | 7     | Teaching students how to guide the patient through imaging to best view diseases for the lecture. | <ul style="list-style-type: none"> <li>• Image quality</li> <li>- exposure factor,</li> <li>- brightness,</li> <li>- contrast,</li> <li>- resolution,</li> <li>- distortion , noise</li> </ul> | Lecture + Practical | Quizzes and Oral Exams |
| 3rd  | 7     | Teaching students how to guide the patient through imaging to best view diseases for the lecture. | Shoulder joint, AP, lateral, supero-inferior & oblique                                                                                                                                         | Lecture + Practical | Quizzes and Oral Exams |
| 4th  | 7     | Teaching students how to guide the patient through imaging to best view diseases for the lecture. | Glenohumeral joint positions                                                                                                                                                                   | Lecture + Practical | Quizzes and Oral Exams |
| 5th  | 7     | Teaching students how to guide the patient through imaging to best view diseases for the lecture. | Acromioclavicular joints                                                                                                                                                                       | Lecture + Practical | Quizzes and Oral Exams |
| 6th  | 7     | Teaching students how to guide the patient through imaging to best view diseases for the lecture. | Clavicle positions                                                                                                                                                                             | Lecture + Practical | Quizzes and Oral Exams |
| 7th  | 7     | Teaching students how to guide the patient through imaging to best                                | Sternoclavicular joints                                                                                                                                                                        | Lecture + Practical | Quizzes and Oral Exams |

|      |   |                                                                                                   |                                                    |                     |                        |
|------|---|---------------------------------------------------------------------------------------------------|----------------------------------------------------|---------------------|------------------------|
|      |   | view diseases for the lecture.                                                                    |                                                    |                     |                        |
| 8th  | 7 | Teaching students how to guide the patient through imaging to best view diseases for the lecture. | Scapula & Coracoid process positions               | Lecture + Practical | Quizzes and Oral Exams |
| 9th  | 7 | Teaching students how to guide the patient through imaging to best view diseases for the lecture. | Humerus distal and proximal fracture               | Lecture + Practical | Quizzes and Oral Exams |
| 10th | 7 | Teaching students how to guide the patient through imaging to best view diseases for the lecture. | Forearm, radius and ulna, type of fracture         | Lecture + Practical | Quizzes and Oral Exams |
| 11th | 7 | Teaching students how to guide the patient through imaging to best view diseases for the lecture. | Elbow joint, AP, Lateral, oblique, shown structure | Lecture + Practical | Quizzes and Oral Exams |
| 12th | 7 | Teaching students how to guide the patient through imaging to best view diseases for the lecture. | Hand positions, shown structures                   | Lecture + Practical | Quizzes and Oral Exams |
| 13th | 7 | Teaching students how to guide the patient through imaging to best view diseases for the lecture. | Thumb& fingers positions                           | Lecture + Practical | Quizzes and Oral Exams |
| 14th | 7 | Teaching students how to guide the patient through imaging to best view diseases for the lecture. | Scaphoid bone positions, shown structures          | Lecture + Practical | Quizzes and Oral Exams |
| 15th | 7 | Teaching students how to guide the patient through imaging to best view diseases for              | Wrist positions, shown structures                  | Lecture + Practical | Quizzes and Oral Exams |

|                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |  |  |
|-----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|
|                                                                                                                       | the lecture.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |  |  |
| 11. Course Evaluation                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |  |  |
| The students will be assessed through a midterm exam (40 marks) + a final exam (60 marks), with a total of 100 marks. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |  |  |
| 12. Learning and Teaching Resources                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |  |  |
| Required textbooks (curricular books, if any)                                                                         | Books recommended by the Ministry of Higher Education and Scientific Research for the subject of Radiological Imaging Techniques.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |  |  |
| Main references (sources)                                                                                             | <ul style="list-style-type: none"> <li>Whitley, A. S., Jefferson, G., Holmes, K., Sloane, C., Anderson, &amp; Hoadley, G.(2015) .Clark's Positioning in Radiography 10th ed. Elsevier Health Science</li> <li>Bontrager, K. L., &amp; Lampignano, J. (2013). Bontrager's handbook of radiographic positioning and techniques. Elsevier Health Science</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |  |  |
| Recommended books and references (scientific journals, reports...)                                                    | Research Gate Journal of Scientific Research                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |  |  |
| Electronic References, Websites                                                                                       | <ol style="list-style-type: none"> <li><b>Radiopaedia:</b> A free educational website that contains articles and clinical images in the field of medical imaging. Link: <a href="http://www.radiopaedia.org">www.radiopaedia.org</a></li> <li><b>American College of Radiology (ACR):</b> Contains guidelines and references related to medical imaging and clinical practices.Link: <a href="http://www.acr.org">www.acr.org</a></li> <li><b>RSNA (Radiological Society of North America):</b> Provides educational resources, research, and recent articles on medical imaging.Link: <a href="http://www.rsna.org">www.rsna.org</a></li> <li><b>National Institutes of Health (NIH) - Imaging:</b> A scientific platform containing research and reports on the applications of medical imaging Link: <a href="http://www.nih.gov">www.nih.gov</a></li> <li><b>Physics Open Resources by IAEA:</b> Educational resources on medical physics and imaging technologies provided by the International Atomic Energy Agency.Link: <a href="http://www.iaea.org">www.iaea.org</a></li> <li><b>PubMed:</b> A scientific database that contains research papers and articles in the field of medical imaging. Link: <a href="http://pubmed.ncbi.nlm.nih.gov">pubmed.ncbi.nlm.nih.gov</a></li> <li><b>Computed Tomography (CT) Basics:</b> A platform that focuses on explaining the principles of computed tomography in a simplified manner. Link: <a href="http://www.ctisus.com">www.ctisus.com</a></li> <li><b>European Society of Radiology (ESR):</b> Offers articles and training courses related to advancements in medical imaging.Link: <a href="http://www.myesr.org">www.myesr.org</a></li> </ol> |  |  |  |

## Course Description for Radiological anatomy of head and upper limbs

|                                                                     |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                             |                 |                   |
|---------------------------------------------------------------------|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|-----------------|-------------------|
| 1. Course Name:                                                     |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                             |                 |                   |
| <b>Radiological anatomy of head and upper limbs</b>                 |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                             |                 |                   |
| 2. Course Code:                                                     |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                             |                 |                   |
| MTRA2202                                                            |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                             |                 |                   |
| 3. Semester / Year:                                                 |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                             |                 |                   |
| Annual System                                                       |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                             |                 |                   |
| 4. Description Preparation Date:                                    |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                             |                 |                   |
| <b>2026-2025</b>                                                    |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                             |                 |                   |
| 5. Available Attendance Forms:                                      |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                             |                 |                   |
| <b>Daily attendance</b>                                             |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                             |                 |                   |
| 6. Number of Credit Hours (Total) / Number of Units (Total)         |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                             |                 |                   |
| 90hrs./ units4                                                      |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                             |                 |                   |
| 7. Course administrator's name (mention all, if more than one name) |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                             |                 |                   |
| Name: Fairooz Fathi Abdel Hassan                                    |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                             |                 |                   |
| Email: fairooz.fathi@alayen.edu.iq                                  |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                             |                 |                   |
| 8. Course Objectives                                                |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                             |                 |                   |
| <b>Course Objectives</b>                                            |              | <ul style="list-style-type: none"> <li>Providing students with knowledge about radiographic anatomy in general, how to read radiographic images, and identifying anatomical structures within them.</li> <li>Enhancing knowledge and understanding of radiation hazards and their long-term effects.</li> <li>Preparing and qualifying radiology technicians with scientific knowledge and professional skills to solve health problems in the field of radiology technology.</li> <li>Developing and encouraging scientific research by utilizing research findings and their applications.</li> </ul> |                             |                 |                   |
| 9. Teaching and Learning Strategies                                 |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                             |                 |                   |
| <b>Strategy</b>                                                     |              | Asking questions and guiding students to discover the answers themselves.<br>Using animations and videos to explain scientific concepts.<br>Utilizing discussions and interactive activities to enhance engagement and understanding.<br>Measuring students' progress through continuous assessments such as short quizzes.<br>Allowing students to train in a real-world environment to acquire practical skills.                                                                                                                                                                                      |                             |                 |                   |
| 10. Course Structure                                                |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                             |                 |                   |
| <b>Week</b>                                                         | <b>Hours</b> | <b>Required Learning</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>Unit or subject name</b> | <b>Learning</b> | <b>Evaluation</b> |

|   |   | <b>Outcomes</b>                                                                                                                                         |                                                                                                                              | <b>method</b>                                                                                  | <b>method</b>                                                    |
|---|---|---------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|------------------------------------------------------------------|
| 1 | 6 | Identify the anatomical structure of the skull.<br>Recognize bones, joints, and important structures. Relate normal anatomy to clinical applications.   | Normal anatomy of the skull (cranial) bones.                                                                                 | Theoretical lectures supported by anatomical images and 3D sections. Analytical workshops.     | Written exams. Radiographic image analysis of the skull.         |
| 2 | 6 | Interpret skull radiographs. Identify normal radiographic landmarks. Compare normal and pathological cases.                                             | Radiological features of the skull (cranial) bones.                                                                          | Interactive lectures using X-rays and CT scans. Clinical case studies.                         | Radiographic image analysis. Written exams.                      |
| 3 | 6 | Recognize the components of facial bones. Analyze anatomical relationships between different bones. Relate normal anatomy to radiographic applications. | Normal anatomy of the facial bones.                                                                                          | Lectures with anatomical images and models. Practical sessions for radiographic anatomy study. | Written exams. Radiographic image analysis of facial bones.      |
| 4 | 6 | Interpret X-rays of facial bones. Identify normal and pathological radiographic changes. Analyze radiographic positioning for facial bones.             | Radiological features of the facial bones.                                                                                   | Interactive lectures. Clinical case studies using radiographic images.                         | Written exams. Radiographic image analysis of facial bones.      |
| 5 | 6 | Identify the anatomical structures of the nasal cavity and sinuses. Interpret normal radiographic images.                                               | Normal anatomy of nasal cavity & paranasal sinuses. Radiology of the nasal cavity and paranasal sinuses.                     | Theoretical lectures. Sessions for radiographic and CT image analysis.                         | Written and practical exams. Radiographic and CT image analysis. |
| 6 | 6 | Identify radiographic features of the scapula. Recognize ossification centers of the scapula. Analyze injury-related changes.                           | shoulder girdle (scapula and clavicle bones). Radiological features of the scapula and clavicle bones. Ossification centers. | Lectures with clinical applications. Radiographic image analysis.                              | Written and practical exams. Radiographic image analysis.        |

|    |   |                                                                                                                                                                  |                                                                                                                                              |                                                                        |                                                                  |
|----|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|------------------------------------------------------------------|
| 7  | 6 | Identify the radiographic characteristics of the clavicle. Recognize major ossification centers.                                                                 | Normal anatomy of the humerus, radiological features of the humerus. Ossification center.                                                    | Interactive lectures.                                                  | Written and practical exams.                                     |
| 8  | 6 | Identify the ossification centers of the humerus. Interpret normal and pathological radiographic images.                                                         | Normal anatomy of the radius and ulna bones, radiological features of the radius and ulna bone. Ossification centers.                        | Interactive lectures. Radiographic image analysis.                     | Written exams. Radiographic image analysis of the humerus.       |
| 9  | 6 | Identify the ossification centers of the radius and ulna. Interpret normal and pathological radiographic images.                                                 | Normal anatomy of the hand, radiological features of the hand. Ossification centers.                                                         | Interactive lectures. Radiographic image analysis.                     | Written exams. Radiographic image analysis.                      |
| 10 | 6 | Identify the radiographic characteristics of hand bones. Recognize ossification centers in the wrist, metacarpals, and phalanges. Interpret radiographic images. | Shoulder joint: components, type of joint, articulating surfaces, joint capsule, labrum, ligaments, radiological features of shoulder joint. | Lectures with clinical applications. Radiographic image analysis.      | Written and practical exams. Radiographic image analysis.        |
| 11 | 6 | Identify the components of the shoulder joint. Interpret normal radiographic images of the shoulder joint.                                                       | Elbow joint: components, articulating surfaces, ligaments & radiological feature of the elbow joint.                                         | Theoretical lectures. Sessions for radiographic and CT image analysis. | Written and practical exams. Radiographic and CT image analysis. |
| 12 | 6 | Identify the components of the elbow joint. Analyze its radiographic characteristics.                                                                            | Wrist joint: components, articulating surfaces, ligaments & radiological features of the wrist joint.                                        | Interactive lectures. Radiographic image analysis.                     | Written exams. Radiographic image analysis.                      |
| 13 | 6 | Identify the components of the wrist joint. Analyze its radiographic characteristics.                                                                            | Blood supply of upper limbs: Arteries of the upper limb.                                                                                     | Interactive lectures. Radiographic image analysis.                     | Written exams. Radiographic image analysis.                      |
| 14 | 6 | Identify the arterial supply of the upper limb. Analyze                                                                                                          | Radiological features of the upper limb arteries.                                                                                            | Interactive lectures. Radiographic                                     | Written exams. Radiographic                                      |

|                                                                                                                                                                     |   |                                                                                                           |                                                                                                                                                                                                                                                                                                                  |                                                    |                                             |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|-----------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|---------------------------------------------|
|                                                                                                                                                                     |   | radiographic images of blood vessels.                                                                     |                                                                                                                                                                                                                                                                                                                  | image analysis.                                    | image analysis.                             |
| 15                                                                                                                                                                  | 6 | Identify the major veins of the upper limb. Interpret normal and pathological venous radiographic images. | Veins of the upper limb, Radiological features of the upper limb veins                                                                                                                                                                                                                                           | Interactive lectures. Radiographic image analysis. | Written exams. Radiographic image analysis. |
| <b>11. Course Evaluation</b>                                                                                                                                        |   |                                                                                                           |                                                                                                                                                                                                                                                                                                                  |                                                    |                                             |
| Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc |   |                                                                                                           |                                                                                                                                                                                                                                                                                                                  |                                                    |                                             |
| <b>12. Learning and Teaching Resources</b>                                                                                                                          |   |                                                                                                           |                                                                                                                                                                                                                                                                                                                  |                                                    |                                             |
| Required textbooks (curricular books, if any)                                                                                                                       |   |                                                                                                           | Curriculum of the College of Medical and Health echnology/Baghd                                                                                                                                                                                                                                                  |                                                    |                                             |
| Main references (sources)                                                                                                                                           |   |                                                                                                           | 1. Kelley, L. L., & Petersen, C. (2018). <b><i>Sectional Anatomy for Imaging Professionals</i></b> . Third & fourth edition.<br>2. Ryan, S., McNicholas, M., & Eustace, S. (2011). <i>Anatomy for diagnostic imaging</i> .<br>3.Lazo, D. L. (2015). <i>Fundamentals of sectional anatomy an imaging approach</i> |                                                    |                                             |
| Recommended books and references (scientific journals, reports...)                                                                                                  |   |                                                                                                           | Ryan, S., McNicholas,M.,& Eustace,S.(2011). <i>Anatomy for diagnostic imaging</i>                                                                                                                                                                                                                                |                                                    |                                             |
| Electronic References, Websites                                                                                                                                     |   |                                                                                                           | Studies published in pubmed and scopus                                                                                                                                                                                                                                                                           |                                                    |                                             |



## Course Description for Physics of Computed Tomography

|                                                                     |              |                                                                                                                                                                                                                                                                                                                                                                 |                             |                                                               |                                                                             |
|---------------------------------------------------------------------|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|---------------------------------------------------------------|-----------------------------------------------------------------------------|
| 1. Course Name:                                                     |              |                                                                                                                                                                                                                                                                                                                                                                 |                             |                                                               |                                                                             |
| <b>Physics of Computed Tomography</b>                               |              |                                                                                                                                                                                                                                                                                                                                                                 |                             |                                                               |                                                                             |
| 2. Course Code:                                                     |              |                                                                                                                                                                                                                                                                                                                                                                 |                             |                                                               |                                                                             |
| MTRA2205                                                            |              |                                                                                                                                                                                                                                                                                                                                                                 |                             |                                                               |                                                                             |
| 3. Semester / Year:                                                 |              |                                                                                                                                                                                                                                                                                                                                                                 |                             |                                                               |                                                                             |
| <b>First semester 2026–2025</b>                                     |              |                                                                                                                                                                                                                                                                                                                                                                 |                             |                                                               |                                                                             |
| 4. Description Preparation Date:                                    |              |                                                                                                                                                                                                                                                                                                                                                                 |                             |                                                               |                                                                             |
| <b>2026–2025</b>                                                    |              |                                                                                                                                                                                                                                                                                                                                                                 |                             |                                                               |                                                                             |
| 5. Available Attendance Forms:                                      |              |                                                                                                                                                                                                                                                                                                                                                                 |                             |                                                               |                                                                             |
| <b>Daily attendance</b>                                             |              |                                                                                                                                                                                                                                                                                                                                                                 |                             |                                                               |                                                                             |
| 6. Number of Credit Hours (Total) / Number of Units (Total)         |              |                                                                                                                                                                                                                                                                                                                                                                 |                             |                                                               |                                                                             |
| 75hrs./ units3                                                      |              |                                                                                                                                                                                                                                                                                                                                                                 |                             |                                                               |                                                                             |
| 7. Course administrator's name (mention all, if more than one name) |              |                                                                                                                                                                                                                                                                                                                                                                 |                             |                                                               |                                                                             |
| Name: Reda Mohammed Ahmed                                           |              |                                                                                                                                                                                                                                                                                                                                                                 |                             |                                                               |                                                                             |
| Email: redaelsaman8@gmail.com                                       |              |                                                                                                                                                                                                                                                                                                                                                                 |                             |                                                               |                                                                             |
| 8. Course Objectives                                                |              |                                                                                                                                                                                                                                                                                                                                                                 |                             |                                                               |                                                                             |
| <b>Course Objectives</b>                                            |              | <ul style="list-style-type: none"> <li>Understanding the basic principles of physics used in CT devices.</li> <li>Learning about different imaging techniques.</li> <li>Analyzing data flow in a CT device.</li> <li>Understanding the generations of CT.</li> <li>Studying image planes.</li> </ul>                                                            |                             |                                                               |                                                                             |
| 9. Teaching and Learning Strategies                                 |              |                                                                                                                                                                                                                                                                                                                                                                 |                             |                                                               |                                                                             |
| <b>Strategy</b>                                                     |              | <ul style="list-style-type: none"> <li><b>Conducting practical experiments using different software.</b></li> <li><b>Utilizing an interactive teaching approach through demonstrations of how CT works.</b></li> <li><b>Assigning students projects aimed at applying theoretical concepts to solve practical problems related to the use of CT.</b></li> </ul> |                             |                                                               |                                                                             |
| 10. Course Structure                                                |              |                                                                                                                                                                                                                                                                                                                                                                 |                             |                                                               |                                                                             |
| <b>Week</b>                                                         | <b>Hours</b> | <b>Required Learning Outcomes</b>                                                                                                                                                                                                                                                                                                                               | <b>Unit or subject name</b> | <b>Learning method</b>                                        | <b>Evaluation method</b>                                                    |
| 1                                                                   | 2            | Introducing students to the concept of computed tomography , its development and applications.                                                                                                                                                                                                                                                                  | Introduction and overview   | Delivering lectures using information technology (computers). | Conducting practical and theoretical exams (midterm + final semester exam). |

|    |   |                                                                                         |                                          |                                                               |                                                                             |
|----|---|-----------------------------------------------------------------------------------------|------------------------------------------|---------------------------------------------------------------|-----------------------------------------------------------------------------|
| 2  | 2 | Detailed explanation of x-rays and their interactions.                                  | Basic Physics                            | Delivering lectures using information technology (computers). | Conducting practical and theoretical exams (midterm + final semester exam). |
| 3  | 2 | Explaining in detail the factors that affect image quality                              | CT numbers                               | Delivering lectures using information technology (computers). | Conducting practical and theoretical exams (midterm + final semester exam). |
| 4  | 2 | Teaching the student how a ct image is formed                                           | CT image                                 | Delivering lectures using information technology (computers). | Conducting practical and theoretical exams (midterm + final semester exam). |
| 5  | 2 | Clarifying how data is collected to obtain fine details required for image construction | Data Acquisition                         | Delivering lectures using information technology (computers). | Conducting practical and theoretical exams (midterm + final semester exam). |
| 6  | 2 | Explaining the techniques used to enhances data acquisition accuracy                    | Data Acquisition Geometries              | Delivering lectures using information technology (computers). | Conducting practical and theoretical exams (midterm + final semester exam). |
| 7  | 2 | Understanding of dual source ct imaging                                                 | Fifth Generation Scanners                | Delivering lectures using information technology (computers). | Conducting practical and theoretical exams (midterm + final semester exam). |
| 8  | 2 | Introducing the student to mlti slice ct techniques                                     | Multislice Computed Tomography           | Delivering lectures using information technology (computers). | Conducting practical and theoretical exams (midterm + final semester exam). |
| 9  | 2 | Explaining how data captured by ct device is processed.                                 | Data Processing                          | Delivering lectures using information technology (computers). | Conducting practical and theoretical exams (midterm + final semester exam). |
| 10 | 2 | Clarifying how the image is reconstructed in ct system                                  | Data Flow in a CT Scanner                | Delivering lectures using information technology (computers). | Conducting practical and theoretical exams (midterm + final semester exam). |
| 11 | 2 | Teaching the student how to display the obtained images                                 | Image display, Storage and communication | Delivering lectures using information technology              | Conducting practical and theoretical exams (midterm + final semester exam). |

|    |   |                                                                                                  |                     |                                                               |                                                                             |
|----|---|--------------------------------------------------------------------------------------------------|---------------------|---------------------------------------------------------------|-----------------------------------------------------------------------------|
|    |   |                                                                                                  |                     | (computers).                                                  |                                                                             |
| 12 | 2 | Explaining image formatting requirements                                                         | Format the CT image | Delivering lectures using information technology (computers). | Conducting practical and theoretical exams (midterm + final semester exam). |
| 13 | 2 | Discussing the concept of focusing to achieve Optimal image clarity.                             | Field of View in CT | Delivering lectures using information technology (computers). | Conducting practical and theoretical exams (midterm + final semester exam). |
| 14 | 2 | Providing students with a deep understanding of fundamental principles such as x-ray absorption. | Basic CT Physics    | Delivering lectures using information technology (computers). | Conducting practical and theoretical exams (midterm + final semester exam). |
| 15 | 2 | Explaining the different planes of ct image                                                      | Image Axes          | Delivering lectures using information technology (computers). | Conducting practical and theoretical exams (midterm + final semester exam). |

### 11. Course Evaluation

The student will be assessed through a midterm exam (40 marks) + a final exam (60 marks), with a total of 100 marks.

### 12. Learning and Teaching Resources

|                                                                    |                                                                                          |
|--------------------------------------------------------------------|------------------------------------------------------------------------------------------|
| Required textbooks (curricular books, if any)                      | Computed Tomography: Principles , Design, Artifacts, and Recent Advanced: by jiang Hsieh |
| Main references (sources)                                          | Computed Tomography: Principles , Design, Artifacts, and Recent Advanced: by jiang Hsieh |
| Recommended books and references (scientific journals, reports...) | European Radiology Medical physics                                                       |
| Electronic References, Websites                                    | <a href="http://www.ncbi.nlm.nih.gov/pmc">www.ncbi.nlm.nih.gov/pmc</a>                   |

## Course Description for Special radiological procedures of biliary and reproductive system

|                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Course Name:                                                     | Special radiological procedures of biliary and reproductive system                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 2. Course Code:                                                     | MTRA2203                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 3. Semester / Year:                                                 | Annual System                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 4. Description Preparation Date:                                    | 2026–2025                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 5. Available Attendance Forms:                                      | Daily attendance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 6. Number of Credit Hours (Total) / Number of Units (Total)         | 105hrs./ units4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 7. Course administrator's name (mention all, if more than one name) | Name: Dr. Ahmed MohamedBaqer Easa<br>Email: <a href="mailto:ahmedeasa1985@gmail.com">ahmedeasa1985@gmail.com</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 8. Course Objectives                                                | <p><b>Course Objectives for Program</b></p> <ol style="list-style-type: none"> <li>1. <b>Enhance theoretical knowledge and practical skills:</b> Learn various radiographic examination techniques, including X-ray, MRI, and CT, with hands-on training on advanced medical equipment.</li> <li>2. <b>Promote safety and quality standards:</b> Understand radiation safety measures and protocols to ensure a safe environment for patients and healthcare teams.</li> <li>3. <b>Medical image analysis and decision-making:</b> Enable students to accurately interpret and analyze medical images while developing critical thinking skills for sound diagnostic decisions.</li> <li>4. <b>Professional readiness and effective communication:</b> Prepare students to work efficiently in multidisciplinary medical environments and improve communication skills with healthcare teams and patients.</li> <li>5. <b>Keep up with technological advancements:</b> Stay updated on the latest innovations and technologies in radiographic examinations to ensure best practices are applied.</li> </ol> |
| 9. Teaching and Learning Strategies                                 | <ol style="list-style-type: none"> <li>1. <b>Theoretical lectures:</b> Explain fundamental concepts using interactive teaching tools.</li> <li>2. <b>Practical training:</b> Apply imaging techniques in laboratories and hospitals.</li> <li>3. <b>Case-based learning:</b> Analyze and study real clinical cases to develop decision-making skills.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

4. **Simulation:** Use simulation software to train students on procedures before working with patients.
5. **Group discussions:** Discuss scientific topics and clinical cases in group settings.
6. **Projects and research:** Prepare research papers and projects related to medical imaging techniques.
7. **Blended learning:** Combine traditional and online education using educational platforms.
8. **Clinical training:** Apply knowledge practically in hospitals under the supervision of specialists.
9. **Self-directed learning:** Encourage exploration of scientific references and participation in workshops.

## 10. Course Structure

| Week | H | Unit or subject name                                   | Required Learning Outcomes                                                                  | Learning method                   | Evaluation method                     |
|------|---|--------------------------------------------------------|---------------------------------------------------------------------------------------------|-----------------------------------|---------------------------------------|
| 1    | 7 | Methods of imaging of hepatobiliary system             | Understanding various imaging techniques for the hepatobiliary system                       | Lecture + Practical demonstration | Short test + Oral questions           |
| 2    | 7 | U/S of the liver, gall bladder and biliary system      | Mastering ultrasound examination of the liver, gallbladder, and biliary system              | Practical lab training            | Practical assessment + Report         |
| 3    | 7 | CT for the liver biliary tree                          | Understanding the use of CT for imaging the liver biliary tree                              | Lecture + Practical training      | Practical test + Case study           |
| 4    | 7 | MRI of the liver                                       | Understanding MRI techniques for imaging the liver                                          | Lecture + Practical session       | Oral test + Practical assessment      |
| 5    | 7 | Intraoperative & postoperative T-tube, cholangiography | Understanding imaging techniques during and after surgery using T-tubes and cholangiography | Lecture + Educational video       | Test questions + Practical assessment |
| 6    | 7 | Biliary drainage                                       | Learning biliary drainage techniques using different imaging methods                        | Lecture + Practical session       | Report + Oral questions               |
| 7    | 7 | Methods of imaging of urinary tracts                   | Understanding different imaging methods for the urinary tract                               | Lecture + Practical session       | Practical assessment + Report         |
| 8    | 7 | Excretion urography                                    | Learning the use of radiographic imaging for                                                | Lecture + Practical               | Practical test + Case analysis        |

|    |   |                                            |                                                                               |                                   |                                  |
|----|---|--------------------------------------------|-------------------------------------------------------------------------------|-----------------------------------|----------------------------------|
|    |   |                                            | the urinary system                                                            | session                           |                                  |
| 9  | 7 | CT urinary tract                           | Understanding the use of CT for urinary tract imaging                         | Lecture + Practical session       | Practical test + Report          |
| 10 | 7 | MRI of the urinary tract                   | Learning MRI techniques for imaging the urinary tract                         | Lecture + Practical session       | Oral test + Practical assessment |
| 11 | 7 | Micturating cystourethrography             | Understanding cystourethrography imaging during micturition                   | Lecture + Practical session       | Oral questions + Practical test  |
| 12 | 7 | Ascending urethrography in the male        | Learning how to perform ascending urethrography in males                      | Lecture + Educational video       | Report + Practical assessment    |
| 13 | 7 | Retrograde pyelourethrography              | Understanding retrograde pyelourethrography imaging                           | Lecture + Practical demonstration | Theoretical test + Case analysis |
| 14 | 7 | Hysterosalpingography                      | Learning the use of radiography for the uterus and fallopian tubes            | Lecture + Practical session       | Practical test + Report          |
| 15 | 7 | Percutaneous nephrostomy & nephrolithotomy | Understanding the procedures for percutaneous nephrostomy and nephrolithotomy | Lecture + Practical session       | Practical test + Report          |

## 11. Course Evaluation

The students will be assessed through a midterm exam (40 marks) + a final exam (60 marks), with a total of 100 marks.

## 12. Learning and Teaching Resources

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|--------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Required textbooks<br>(curricular books, if any) | Watson, N. & Jones, H. chapman & Nakielnys<br>"Guide to Radiological procedures", 7th edition, Elsevier Health Sciences, 2017.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Main references (sources)                        | <ol style="list-style-type: none"> <li>1. <b>Textbook of Radiology and Imaging</b> by David Sutton</li> <li>2. <b>Fundamentals of Diagnostic Radiology</b> by William E. Brant and Clyde A. Helms</li> <li>3. <b>Radiology: Diagnostic Imaging</b> by Peter Armstrong</li> <li>4. <b>Clinical Radiology: The Essentials</b> by Adam W. Mitchell</li> <li>5. <b>MRI in Practice</b> by Catherine Westbrook and John Talbot</li> <li>6. <b>Computed Tomography: Principles, Design, Artifacts, and Recent Advances</b> by Jiang Hsieh</li> <li>7. <b>Ultrasonography in Obstetrics and Gynecology</b> by Peter W. Callen</li> <li>8. <b>Radiology for the Small Animal Practitioner</b> by Jodi A. Westropp</li> </ol> |

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|--------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                    | <p>9. <b>PACS: A Guide to the Digital Revolution</b> by H. K. Chung</p> <p>10. <b>Manual of Clinical Oncology</b> by John L. Marshall</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Recommended books and references (scientific journals, reports...) | <p><b>Supporting Books and References:</b></p> <ol style="list-style-type: none"> <li>1. Radiology Review Manual by Wolfgang Dähnert</li> <li>2. Atlas of Radiographic Anatomy by Lorrie L. Kelley</li> <li>3. Radiology for Medical Graduates by R. D. O'Neill</li> <li>4. Diagnostic Radiology: Physics and Technology by Philip J. P. Berman</li> <li>5. Introduction to Radiologic Technology by William J. Callaway</li> <li>6. The Radiology of Skeletal Trauma by Thomas L. Pope Jr. and Michael D. O'Malley</li> <li>7. Emergency Radiology: Case Reviews by David R. Collins and Joseph S. Galati</li> <li>8. Diagnostic Imaging for the Emergency Physician by R. Patrick Yochum and Lorrie L. Kelley</li> </ol> <p><b>Scientific Journals:</b></p> <ol style="list-style-type: none"> <li>1. Radiology</li> <li>2. American Journal of Roentgenology (AJR)</li> <li>3. European Radiology</li> <li>4. Journal of Computer Assisted Tomography</li> <li>5. Magnetic Resonance Imaging</li> <li>6. Ultrasound in Medicine &amp; Biology</li> <li>7. Journal of Nuclear Medicine</li> </ol> <p><b>Reports:</b></p> <ol style="list-style-type: none"> <li>1. Radiology Information System (RIS) Reports</li> <li>2. Clinical Practice Guidelines for Imaging</li> <li>3. American College of Radiology (ACR) <i>Appropriateness Criteria</i></li> </ol> |
| Electronic References, Websites                                    | <ol style="list-style-type: none"> <li>1. <b>PubMed</b> (<a href="https://pubmed.ncbi.nlm.nih.gov">https://pubmed.ncbi.nlm.nih.gov</a>)</li> <li>2. <b>Radiopaedia</b> (<a href="https://radiopaedia.org">https://radiopaedia.org</a>)</li> <li>3. <b>Radiology Masterclass</b> (<a href="https://www.radiologymasterclass.co.uk">https://www.radiologymasterclass.co.uk</a>)</li> </ol> <p><b>American College of Radiology (ACR)</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |